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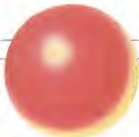
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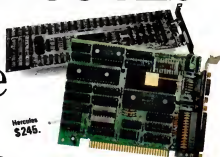
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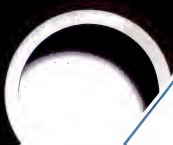
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What's Inside

Microcomputers are growing more powerful all the time, but they'll never be able to match the speed and capabilities of a mainframe. So, if you can't beat 'em, join 'em.

In spite of the popularity of microcomputers, many people still look to mainframes for really highspeed work. In this issue of *PC*, we aim for a compromise.

While the word is that microcomputers are taking over the business world, there is a dirty little secret that most of us in microcomputer-related industries are loathe to admit. We may try to hide it under a devil-may-care facade, but in the privacy of our offices, we chafe under a severe case of—well, you know what it is as well as I do.

Mainframe envy.

Let's face it, isn't that what motivates almost everybody with a PC on his or her desk? In spite of all the talk about business uses and appropriateness of hardware and software, there is one thing that everybody seems to be aiming for: the microcomputer that's faster and more powerful than anyone else's. And what are the fastest and most powerful computers around today? Mainframes, of course!

I rest my case.

Take the example of a typical office manager, Mr. Doe. Introduced to his IBM PC a year or two ago when his company decided that it was time to join the microcomputer age, he was soon happily planning out databases, typing reports with a word processor, and even creating



the occasional pie chart using a simple business presentation graphics package.

Mr. Doe is about as interested in programming as he is in roller skating, and so you'd think that he would be quite happy with his personal computer. Well, think again.

Mr. Doe has just called a meeting with his colleague, Ms. Smith, to discuss the desirability of upgrading their 256K, double-disk-drive PCs.

"So, how are things going with the present arrangement?" asks Ms. Smith.

"I suppose it's alright. I'm pretty happy with my word processor, and the project management package they gave us seems to fill the bill. Only. . ."

"Only what?" asks Smith.

"Well, everything seems so . . . so slow! Admittedly, it only takes a few seconds to save a file, and the grinding of the disk drives sounds a little like a cat purring, but—well, think of the time we could save if we had a proper hard disk system!"

"That's true," Smith admits. "After all, it adds up. If you consider that an XT could process a file, say, 5 seconds faster than a PC, and posit that you save a file 20 times a day, 5 days a week. . ."

"I work Saturdays a lot."

"Okay, 6 days a week—why, that's 10 minutes a week lost just waiting for the computer to work."

"And multiply that by months—it stands to reason that an XT is almost a necessity."

"You know," Smith muses, "for the price it would take to upgrade our computers to XT level, we might as well invest in a couple of PC ATs. After all, no reason to put off a purchase we'll have to make anyway in a couple of years. . ."

"And what about business graphics—as long as we're upgrading, we might as well get a good, high-quality graphics monitor and a good graphics system."

"Then there are touchscreens—I always was bad at typing. . ."

"Tape backup never hurt."

"Nor would an extra disk drive."

WHAT'S INSIDE

Smith smiles. "By the time we're through, ours will rival any computer system our competitors can dream up. Who needs mainframes anyway!"

Of course, our two protagonists are due for a shock. Because no matter how sophisticated your microcomputer system is, if a mainframe is called for (al-

though admittedly, it is called for less and less often), nothing can replace it. On the other hand, why tie up valuable mainframe time for a job that a micro will do just as well?

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The Connection Solution

Many companies are coming up with a solution to this quandary—they are connecting their microcomputers to existing mainframe systems through the latest asynchronous or synchronous communications systems or by enhancing their PCs to emulate IBM 3270 PCs.

However, while connecting your microcomputer to a mainframe system can provide maximum utilization of both systems, the process may not be as simple as you would like. In this issue of PC, we look at what's involved in the micro-mainframe connection.

First, Bill Catchings explains the basics of choosing a micro-mainframe system. Charles Daney then examines the issue more closely and questions whether the result is worth the effort. Frank Derfler, Scott Kariya, Bill Harts, Ed Valenzuela, and John Singer review the various methods available for creating a viable micro-mainframe connection. Finally, Bill Harts contends that the future lies in database manipulators.

Eclectic Extras

Of course, a typical PC issue goes beyond the cover stories, and this issue is no exception. In the category of software, for example, Paul Hulquist reviews *ASYST*, a program for scientific data collection, analysis, and graphic presentation, and Charles Petzold reviews some packages that attempt to organize your desk and your PC. In the category of hardware, Alfred Poor and Robin Webster team up to try out the new Hewlett-Packard 110 portable computer.

There are also the usual eclectic packages of professional columns, news, and reviews, which, together with this issue's cover package, should cure any erstwhile victim of mainframe envy. ■

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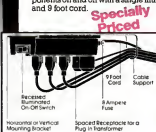
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Juki	6160	R3700	2.85

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80 Micro magazine "studied three other daisy-wheel printers under \$800 and came to the conclusion that the Juki 6100 was by far the best choice. It's smart, has plenty of features... the print quality is excellent." That's because the Juki uses print wheels and ribbons designed not for computer printers but typewriters - where standards for "letter quality" are set. Smart? The print wheel simply drops into place; the printer engages it automatically!

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Quiet? Better than 62 dBA from 1 meter away. No raucous clatter. A big improvement over some printers we listened to. We benchmarked the Silver-Reed EXP 550, Brother HR-1, and Smith-Corona TP-1 and found them two to eight times noisier. 80 Micro agrees: "The Juki 6100 is one of the quietest daisy-wheel printers." Reliable? Ask an engineer about an MTBF of 2800 at 25% duty. Other printers employ intricate wires, pulleys, and springs. They derail, and go out of adjustment. The Juki is elegantly simple, with few moving parts: the print head is drawn across the rail by magnetic attraction.

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Compatibility? The Juki 6100 behaves like a Diablo 630 with your software, and has a parallel interface, fully compatible with your IBM PC, XT, or look-alike. "In a feature-by-feature comparison, the Juki outstrips anything in its class" is Creative Computing's conclusion. So try it! There's a 90 day limited warranty for parts and labor. And if you don't agree that the Juki is an extraordinary value, return it within 30 days for refund of all but shipping and handling. Call us now

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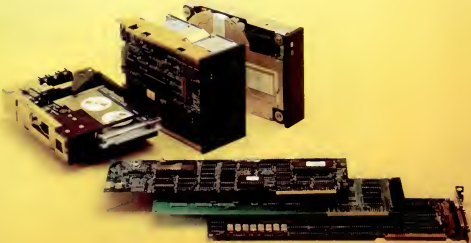
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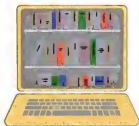
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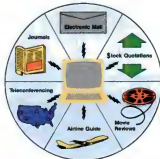
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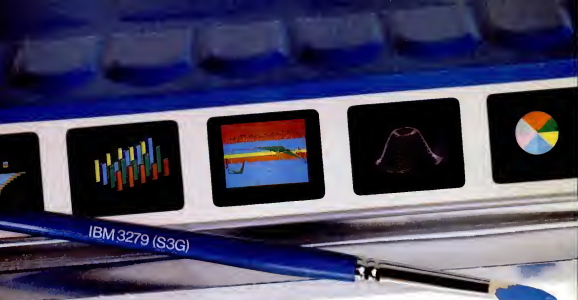
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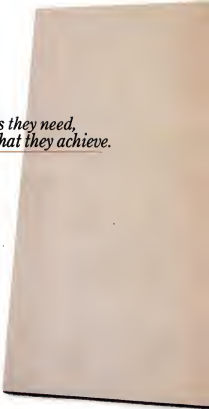
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Neck pain	15%

(Source: "Ergonomic Principles in Office Automation" Pub. 1983 by E.I.S. AB, Sweden.)

The result has been a whole range of computer-induced problems ranging from stress and fatigue to blurred vision.

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IBM News

FROM THE EDITORS OF PC

JANUARY 22, 1985

IBM's Takeover of Rolm Tightens Market Grip

Dropping of antitrust suit opens the way for corporate acquisition.

BY VIRGINIA DUDEK

NEW YORK—As the old song says, "The rich get richer..." At least that seemed to be the prevailing attitude among analysts early this winter when IBM acquired Rolm Corporation, the Santa Clara, Calif., firm that ranks second only to AT&T in the manufacture of telecommunications hardware.

When the Justice Department dropped its antitrust actions shortly after the Presidential elections, it cleared the way for Rolm shareholders to overwhelmingly approve the sale of their company to IBM, which already owned a minority share of the corporation. The only stipulation for dropping the

antitrust action had been that Rolm's military computer unit be sold within 6 months, to which IBM readily agreed.

While industry analysts were not in complete agreement about the future implications of the acquisition, they did concur that the acquisition of Rolm completed an important part of

the picture IBM is drawing of itself as the nation's office automater. The merger provides IBM with a ready-made solution to the problem of how to tie together the loose ends of the computer and telephone industries. And, of course, it positions the company in an even more dominant role than before.

"IBM needed to broaden its product package to include a PBX-type product such as the Rolm CBX, because the PBX is a pivotal piece in the gateway to the office automation and telecommunications world," says Jeff Kaplan, senior market analyst at International Data Corporation in Framingham, Mass. "We're aware that IBM actually built its own PBX system and was not successful. This acquisition marks a solid move into the communications industry."

The announcement came as no surprise, since IBM and Rolm had been discussing the sales since last year, and Rolm had recently announced products that enhanced the IBM PC. Some observers are almost unimpressed with the development and prefer to wait and see.

(continued on next page)

COMMENTARY

Welcome to CALMDEX

BY PAUL SOMERSON

...Or maybe "Welcome to YAWNDEX." The computer jet set makes its annual hajj to Vegas sniffing the air for the big kill—the technological breakthrough that will send the market reeling, the trend that will line some pockets and empty others. This year the most exciting thing was the scramble at the airport to book an early flight home.

While breathless accounts of previous COMDEXes have bitten the pages of the computer

(continued on page 35)



Market Grip (continued)

"Tell me something I didn't already know," says Stephen Weissman, an analyst at International Resource Development, Inc., in Norwalk, Conn. "This does not necessarily mean anything right away. I firmly believe that the IBM spectre is

IBM more competitive leverage. More than 15,000 different companies bought Rolm PBXs. That's a 2½ to 3 million line installed base. IBM is now a major player. Rolm was number two to AT&T and will continue to do well." Bobrowicz expects joint IBM/Rolm

stranglehold on the business market and will concentrate Rolm's development there. "The key for IBM and Rolm is that these will be nice products for anyone who already has the Rolm CBX system and PCs in the business area," says Tim Bajarin, an analyst at Creative

memory dialing, database access, and adds more functionality to the PC. But not everyone will be able to justify the \$1,595 price just to add to the functionality of the computer. However, if you do a lot of on-line disk searches and have a higher memory, then the Jupiter has a lot of merit."



IBM acquires Rolm's communications know-how in the form of Juniper (left) and Cedar (right).

painfully overblown. It is a force to be reckoned with, but this does not mean it will be a success."

Rolm's recent additions to its product line include Cedar, an IBM-compatible, personal communications computer, and Juniper, a multiline digital telephone with built-in speakerphone that enhances PC communications for users who already own a PC. The catch, according to Weissman, is that "they all still require the Rolm PBX. In addition, you can buy several things that do exactly what Juniper will do. If they want to do something remarkable, they need to eliminate the need to have a Rolm system because it's not used by an overriding number of PC users."

Mainframe Memories

Other analysts look only to the immediate future to see the effect of the merger on PC users. "Now IBM is in a position to use PBXs as the gateway to the mainframe system," says Michael Bobrowicz, research analyst at the Gartner Group in Stamford, Conn. "Rolm gives

product announcements within 6 months to a year.

Jeff Kaplan, of IDC, predicts "a number of PC interfaces, LAN hardware, and software development to meet the need for office automation. For large installed bases, companies will begin turning to PBXs. IBM needs a strong product to respond to user requirements."

Others feel that, for now, IBM is just tightening its

Strategies in Cupertino, Calif. "They're aiming at existing Rolm equipment owners—but they can expand."

However, analysts feel the present pricing structure means there won't be long lines and high volume for Rolm's switching boxes. "At this stage, there is strong telecommunications enhancement available from the competition," says Bajarin. "Obviously, the Juniper has

Ups and Downs at COMDEX

You could tell that the computer industry is in a slump just by listening to conversations in the crowds at COMDEX. It seems like it was just a few months ago when you heard attendees excitedly asking things like, "Hey! Where can I see that portable with a full-sized LCD screen?" This year, you most often saw people collared with the question, "Hey! Where did you find that free yo-yo?"

Yes, one clear trend emerged at this fall's COMDEX: This is the season of the yo-yo. Even Dow Jones News/Retrieval was hawking bright red yo-yos—judged the best of breed no less. But the attention the industry now gives to giveaway toys, tennis balls, tie tacks, key chains, and geegaws seems in inverse proportion to the interest in the new computer products.

Still, there are innovative things to look forward to. If waning interest at computer shows starts cutting into attendance, the exhibition hall aisles finally may have enough elbow room so micro makers can hand out personalized hula hoops. ■

Branching Out

The question of the proprietary Rolm system may not keep IBM's own technology from branching out from PBX networks. "The proprietary link maximized the digital features of the PBX for simultaneous voice and data work," says Amy Smith, senior analyst at the Yankee Group in Boston. Conversely, analog systems do not allow simultaneous voice/data transmission over the phone line.

"I think IBM is coming out with its own version of the integrated voice/data terminal that attaches to the phone," adds Smith. "The question is, will it be proprietary for the Rolm PBX or a general-use product. I think IBM has been developing this since before it acquired Rolm. We might see telephony coming out by the end of the next PC product cycle."

Users can also look forward to the inevitable conflict between IBM and AT&T over the office automation systems market. "IBM's existing customer base in mainframes and terminals makes it dominant on the computer end," says Mark Winther, director of new communications services at Link Resources in New York. "AT&T is likewise the vendor for telecommunications managers who traditionally do business with the company. AT&T now has to deal with data managers and MIS personnel, and IBM has to deal with communications managers. They will both have to try to attract customers away from each other. Right now the outcome is still vague."

Yet, IBM's intent is clear. By buying the second largest manufacturer of telecommunications equipment, Big Blue is playing a full-scale version of Dialing for Dollars. ■

CALMDEX (continued)

press, you could have sent all the news about this show home on the back of a postcard: IBM is inching closer toward Total World Domination. The Mac will never be purchased as a real business machine, but novices do have fun playing with it, and Apple is still hanging in there. Monochrome is dead. Serious massore is coming of age. Networks are trying. Capable printers don't have to take a greedy bite out of your wallet and weigh as much as a refrigerator. And, no matter how much you shoehorn into new laptops, no one will take them seriously as long as they sport squinty LCD screens.

While show boss Sheldon G. "P. T." Adelson pronounced his "high holy days of high tech" an unqualified success, many attendees felt otherwise. The 13 miles of aisles, in past years as unnavigable as a rush-hour subway platform, were conspicuously bare. By the final Sunday, traffic had thinned to a pathetic trickle, and not because anyone was sitting in church. A lead article in the official puff sheet plopped outside every hotel room each morning stammered that "foot traffic...was eased considerably over past years, due to more than 50 percent of the exhibits being at sites other than the Convention Center." Sure. COMDEX flacks tried to keep a straight face as they crowed that attendance figures were shattering records, and even threatened that the show might sprawl over to as many as eight far-flung, hard-to-reach sites in 1985. The only surefire way to make a killing in the computer business next year is to come to Nevada in November and drive a cab.

Behind Closed Doors

COMDEX is already spreading off the convention floor; the real action is now behind closed hotel doors. It's retail chains auditioning new shelf fillers. Timorous manufacturers unveiling new products to cautious distributors. Failing companies courting the few venture capitalists not sitting home licking their wounds. Into the rooms vendors come and flee talking

about bankruptcy.

In his upbeat keynote speech, Apple president John Sculley chided the investment community for reflexively tightening their purse strings in response to billions of dollars of losses. He then scolded developers for their lack of innovation, upbraided IBM and AT&T for being big, and lashed out at salutary industry attempts to standardize on non-Apple operating systems. The answer was to give people what they want, Sculley profoundly suggested, which in his case means a mouse and a monochrome one-drive computer you can draw pictures with.

If this show was any indication, people want some pretty strange things. Human Edge was hogging its *Mind Prober* seerware (to help you computerize your chances in the singles-bar meat market) with the slogan, "We'll get you inside her head." Advanced Matrix Technology drew SRO crowds with a printer that did a respect-

able job of playing intricate Bach fugues by buzzing the pins on its pinhead. And engineers at Versatron Corporation, fresh from a TV appearance on "That's Incredible," were bursting their buttons over a toe-operated FootMouse.

COMDEX reporters wear badges trailing fluttery fake silk ribbons stamped "PRESS." This year's were a funeral black (setting the tone for the whole event), and desperate PR types would descend on anyone from the fourth estate to furnish copious answers when there were no questions.

Macro Micros

One of the most frequently asked questions at the Compaq booth was whether the company was ruffling off Ken Price's luxurious 23½-foot-wide \$12,000 keyboard-shaped hand-loomed carpet. The rug was an integral part of one of three separate house-sized walk-through computers on display in the main hall. After all, what would a

show be without three micros each roomier than a Manhattan apartment? Only at the COMDEX carnival could an exhibitor give directions to a booth "right across the aisle under the 15-foot-tall inflatable green frog" and have the errant attendee look in that direction and say, "Where?"

But remember, this is Vegas. Where after stumbling from one hospitality suite to another, you can take in acts like "Bobby Berosini and his talented Orangutans," Boy-Lesque (you don't want to know), Siegfried and Roy and some tigers in "Beyond Belief," or Jubilee, with "a cast of more than 100 and elaborate stage effects including the sinking of the Titanic." Where you can look out a window and see a marquee for Wayne Newton so enormous it could only be designed for orbiting space shuttle pilots who might land down and decide on the spur of the moment to land the thing in the desert and catch the late show. Where you can buy anything, and accordingly, Texas Instruments purchased the entire front page of the local newspaper where the headline "TI introduces Pro-Lite™ computer" beat out "Baby Face fails to survive baboon heart."

Some wags are hinting that there are too many shows, that COMDEX is an anachronism, that year-round malls, such as the computer marts planned for Dallas, Boston, and New York, will supplant such wretched excess. Wrong. Where else can Mitch Kapor and Ed Esber link arms and go giggle at a game-maker's attempt to crash the party? Where else can you rub shoulders with every last one of the shakers and nabobs who power the micro engine? This year, we were in John Sculley's self-proclaimed rut; it is a momentary glitch, a fleeting pause to refresh. All this is abhorrent to speed-crazed members of the fast-lane computer aristocracy who feel they have to remain moving targets to survive. But there is no such thing as perpetual motion. IBM may have flexed its muscles, but giants are slow. Still, it's setting needed standards. There's room for others to pick up the slack. ■

Apple's Sculley Speaks Softly As Keynoter

LAS VEGAS—It was similar to the second Reagan-Mondale debate. Everyone waited for the fireworks, but they never really went off.

Apple's president and chief executive officer, John Sculley, was the keynote speaker at Comdex, and he was slated to discuss competition and survival in the microcomputer world. However, the man who once made Coca-Cola choke on the Pepsi Taste Test promotion never attacked IBM the way most people expected him to do.

He declared that Apple had no intention of bowing to pressures to survive by finding a "niche that IBM doesn't want." He said, "If I thought all there was ahead of us is being a survivor in an IBM world, I never would have come to the personal computer industry."

Sculley later tempered those words with an acknowledgement of IBM's success and good reputation in customer service and management. Sculley added that the companies facing tough times from Big Blue were not those like Apple, but those that hitched their wagon to IBM's star by producing compatibles. "IBM is demonstrating with the introduction of the AT and TopView," he said, "that the ground rules are beginning to change....The many IBM compatibles find themselves in a rut."

The Real Threat

Sculley found the industry's main competition comes not from Boca Raton, but from Tokyo. "To put it bluntly, we've had a fire sale on American technology," and he warned that American industry had to protect its long-term investment in technology from being copied and imitated by Japanese competitors.

Those disappointed that Apple's headman did not use his Comdex platform to throw a few roundhouses in IBM's direction could console themselves in another way. Apple's main exhibit on the Comdex floor continually played its new series of television ads, two of which feature IBM PCs being physically destroyed by frustrated businesspeople

—Don Kennedy

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News In Brief

Taking Stock...Employees of Software Publishing, of Mountain View, California, which manufactures the popular PFS line of software products, weren't sure if their company's attempt to go public would be approved. When visitors broached the subject while visiting Software Publishing's COMDEX booth, they kept conspicuously mum.

But, midway into the convention, the bid was approved, and 1.7 million shares were put on the market at \$7 apiece. This tops off the 4-year success story of the 130-employee company that has built its reputation on low-cost, easy-to-use software packages.

Vice-president Janelle Bedke, who is also a company co-founder, said that the stock offering won't affect how the company does business, although she expects a higher visibility. "The money raised will put us in a stronger financial position, and we'll be able to take advantage of whatever comes along."

Software Publishing has buttressed its position through limited partnership agreements with IBM, MCI Mail, Scholastic, and Dysan (a free PFS-Write demo disk is included in some of Dysan's new packages). New Ashton-Tate president Edward Esber also says he expects Software Publishing to become one of the top four software companies.

"We're feeling strong," says Bedke. "The industry is getting to the point that only those who understand basic business will survive. And we're in for the long run."

Just Like the Post Office... Electronic postal rates have gone up if you use MCI Mail. The company has initiated an \$18-a-year mailbox fee and is tacking on a charge of 15 cents per minute for using its toll-free numbers. MCI also raised the cost of courier-delivered letters 20 percent to 33 percent.

Unchanged items include the standard 51-per-7,500-characters rate and the monthly and yearly fees for advanced use and graphics registration. MCI has started charging a new rate of 45 cents for transmissions of less than 500 characters but offers heavy users a discount.

Leading The Symphony... Those people who believe *Symphony's* manual is a little less than complete will be happy to know that Lotus Development Corporation has signed an agreement that allows Addison-Wesley Publishing Company to publish a series of learning and applications guides for Lotus product users. The first book in the Lotus Learning Series will be *The Lotus Guide to Learning Symphony*, which was written and developed by the marketing services people at Lotus.

Joyce Copland, Addison-Wesley's vice-president and general manager of Microcomputer Books, says *The Lotus Guide to Learning Symphony* is not a replacement for the *Symphony* manual and tutorial. "It is a step-by-step tutorial that will take people by the hand and guide them through all the various aspects and applications of *Symphony*. People will want to keep their documentation close by for reference purposes."

The Lotus Guide to Learning Symphony will compete against two books already on the market: *Mastering Symphony* (Sybex) and

Using Symphony (Que Corp.). Copland believes neither book poses a threat to the success of *The Lotus Guide* because "nobody knows *Symphony* like the people at Lotus do. Lotus is aware of the questions people have about its product, and it also knows all the tricks and shortcuts around these problems."

The Lotus Guide to Learning Symphony costs \$22.95, and you can order it through Addison-Wesley Publishing Company, Reading, MA 01867, (617) 944-3700.

Workable Data... What use is database software if you don't have any data to manage? Workbase, a division of Lawrence Information Systems, is ready to provide both the tools and the raw material.

Workbase data management software is a command language that is designed to handle time series data. Using it, you load sets of figures into a read-only "mainbase," which you draw upon to do further manipulations and analysis in a "workbase." The program's commands provide many statistical functions, such as multiseres regressions. Within a workbase, you can screen edit tables, charts, and text to create a finished report. Workbase can exchange data with other programs, including 1-2-3, WordStar, and dBASE II. Workbase sells for \$889; an enhancement for handling plotter graphics costs an additional \$380.

Workbase also supplies Data Baskets—sets of disks or Tallgrass tape cartridges that contain economic databases, such as the Department of Commerce's Price Indexes and Citibank's proprietary 3.5-megabyte Citibase. Until now, users could access these databases only through time-sharing services. Workbase will provide these databases as monthly, quarterly, or annual updates (Citibase's prices are \$2,340, \$1,180, and \$790, respectively).

For more information, contact Workbase, 410 Albany Post Rd., Croton-on-Hudson, NY 10520, (914) 271-4703.

From A-T to Z...David C. Cole, 32, resigned as head of Ashton-Tate a few months ago, and he wouldn't tell anyone where he was going to work. Now it has been announced that he is the new president of Ziff Corporation, the company that publishes *PC Magazine*. Cole replaces Philip Korsant, who has been named chairman of the board.

The Worm Turns...Vault Corporation continues to make waves with its Prolok Plus, the antipcopying software that supposedly contains a "worm" that will destroy data and even damage disks when illegal copies are run (see *PC*, Volume 3 Number 23, page 54). PC's earlier report explains the industry controversy over this drastic measure, and now one of the Vault Corporation's owners is backing away from the product.

New Ashton-Tate chairman Edward M. Esber says his company will switch from using Prolok Plus on its products and begin protecting *Framework* and *dBASE III* with *Superlock*, from Softguard Systems, of Santa Clara, California. This might be a particularly tough wave for Vault to ride. Ashton-Tate owns 18 percent of Vault.

—compiled by Jane Mintzer



David C. Cole

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Aftermarket Adopting The Lotus Position

Some firms find that riding Lotus's coattails is like riding the back of a tiger.

BY VIRGINIA DUDEK

NEW YORK—Like many of the senators and congressmen being inaugurated this month on the coattails of the Reagan blitz, the smaller software companies are trying to make good on the success of larger developers. In computer jargon, "coattails" is replaced with "aftermarket," but the intent is the same—achieve success by latching onto an bigger success.

But the parasitic image of third-party "aftermarket" vendors is perhaps not the entire picture. In these days of high-powered software competition, vendors who once started in garages (or kitchens or bathrooms) are now in the driver's seat. Their successors, in the garages, looking to find a niche in this more established market, have to be wary of the pitfalls. Someone might swallow up your idea.

Laurence Chapman, president of Micro Decision Systems in Pittsburgh, notes a letter he received from Lotus asking for copies of his 1-2-3 products. Apparently a group within Lotus is now reviewing the aftermarket software.

Wary of Lotus

"This may be innocent," says Chapman, who speculates Lotus may want the information as a service to customers. (The company is planning a publication that will cover news on its own and related products.) "But Lotus could duplicate the functions too. It could steal the idea and, with its size and marketing power, easily beat me."

These events at Lotus indicate that it is starting to take the aftermarket more seriously than it did in the past. "Lotus never had a position or policy toward third-party developers," says Dallas DeFee, president of

Computer Software Consultants, "just total indifference." But he sees that attitude undergoing a change.

DeFee was "disappointed" in the seminars that Lotus held in September for independent software developers (see "Lotus Urges Others to Finish Symphony," PC, Volume 3 Number 22, page 48), but he feels they did help a special class of developers pick up technical support for hooks into Symphony. Whether or not this indicates a new open-arms approach on the part of Lotus remains to be seen.

Chapman feels Lotus is as aggressive as any large corporation would be in its position and does credit Lotus with taking the lead in creating a more open environment for third-party developers as compared to companies such as Sorcim/IUS and Microsoft. However, he is reluctant to become too involved with Symphony add-ons for several reasons.

Template Problems

"Lotus requires a very specific interface with Symphony," he says. "It's more complicated than most developers want to work with. Initially, I think we'll see templates for Symphony but not very many

add-ons. One, because it's too complex, and two, because Lotus does not give you a commitment that it won't immediately come out with the same thing."

All this matters because of the potential profit to anyone who can find the most useful add-on for 1-2-3 or Symphony. Analysts estimate that the 600,000 to 800,000 units of 1-2-3 now in use will generate up to \$10 million in aftermarket sales over the next couple of years. But it seems that no one can expect to get a very big piece of the pie.

An Aftermarket?

Analysts, vendors, and dealers have mixed reviews of the aftermarket offerings they have seen so far. Those optimistic about the "sub-industry" of templates, tutorials, and utilities tend to think the market will be strong because Lotus's installed base is growing. As the best-selling 1-2-3 continues to be considered an industry standard, vendors will shun head-on competition with the Lotuses and Ashton-Tates of the world and attempt to fill in the vertical market niches.

"There is a definite trend towards developing vertical market software around the established tools, as opposed to writing them in COBOL or FORTRAN," says Kathy Lane, manager of software at DataQuest in San Jose, California. And although each application can have a different market size, all types of application products can be developed around 1-2-3."

Those doubtful that the aftermarket will meet the expectations of vendors feel that users will develop their own tem-

plates to meet the individualized needs of their particular work environments. They are also unimpressed with the templates currently available.

"It's quite implausible that anyone other than Lotus will sell to more than 5 percent of the 1-2-3 user base," says Curt Monash, vice president at Paine Webber in New York. "There are scenarios where someone could sell to 2 percent of the base, but there's no reason for an aftermarket product to really take off."

Wave of the Future?

Although sales reports indicate that users seem to be showing thumbs down on templates at present, this could be because the initial market of serious computer users has been saturated. But the next wave of users will be the type of people who do not want to spend the time becoming experts on integrated spreadsheet software.

"More and more new sales of hardware and software are to nonexpert users," says Peter Norton, author of the *Norton Utilities* and a contributing editor of PC. "These users need to be served in a different way. One way is through more packaged solutions. If dealers reject the idea, they're being shortsighted."

But dealers don't see sales or lively interest in templates. "I don't find the 'second wave' a reality," says Joe Harmon, vice-president of merchandising at Dallas-based Compushop. He finds it hard to convince users they need a template after selling them an "all you'll ever need" integrated software package. "When people pay \$695 for software, the appeal of a \$75 template is not there."

Harmon feels add-ons may flourish in a nonretail system, however. Some third-party developers use direct mail and telemarketing to reach specialized markets. "The problem with vertical software is that it doesn't turn fast," says Harmon. "With templates, you've got to wait for the guy running the worm farm to come into the stores. Templates are only profitable for retailers if people buy them in droves."



Illustration by Raymond Ruffalo



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Business Computing

Sensible, but not good enough.

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Softalk Magazine

We agree.

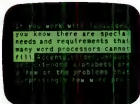
The documentation for WordPerfect 4.0 reflects a great deal of reorganization and improvement. Following a number of suggestions

highest marks yet.

from users and after extensive testing of the new format, SSI is excited to introduce this significantly enhanced documentation package. Many new diagrams have been added and tutorials are more extensive. In addition, the reference section is expanded and better organized for ease of use.

The program does not adequately mark text slated for deletion or movement. The block ought to be highlighted.

InfoWorld Magazine



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Peachtree Peripherals P-10i

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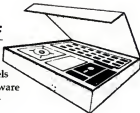
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PRODUCT REVIEW

IBM Masters Mouse And Menu Graphics

PC Palette gives a new look to IBM's graphics software image.

BY TOM BADGETT

IBM has added its own offering to the growing list of color graphics products for the PC. *PC Palette*, one of the Personally Developed Software series, is a versatile screen-drawing program for color or monochrome displays that supports the PC keyboard, a joystick, a mouse, or a digital keypad input device. It's powerful and flexible, and is easy to learn and use. The on-disk documentation is well organized and written with a personality and flair missing from many of the recent IBM Personally Developed packages.

When you first load *PC Palette*, a configuration menu lets you select the display and input device you are using. The PC keyboard remains functional even if you specify a mouse or some other type of input. Next, a blank screen appears with an arrow cursor in the middle and a dense command panel at the bottom. From here, *PC Palette* works very much like *Color Paint* and other sophisticated screen-drawing programs, but with a different set of features.

Drawing Card

The program starts in the line drawing mode, where you use the cursor keys, mouse, or other input device to draw on the screen in the conventional way. You can select four line widths for these drawings. There are 12 drawing fonts, including solid and hollow boxes, vertical and horizontal lines, diagonals, circles, and curves. The paint brushes and spray cans of other screen-drawing utilities are missing, but you can select background and foreground colors, move or copy whole objects or portions of them, and fill drawings with color. You have excellent control over the

drawing crosshair's movement. By using the shift key in conjunction with the cursor keys or mouse movements, you can move the cursor one pixel at a time to draw smooth curves or straight lines.



PC Palette features useful tools not generally available on screen drawing programs.

A background grid is available for precise control over cursor positioning. Grid sizes range from 1 to 64 pixels. The grid may be turned on and off at will, and moved or copied with your drawings. Text support in this drawing package is excellent. The package offers 12 fonts to choose from, although only 4 of them are active at any one time. If you need more than 4 fonts within any drawing, you have to restart *PC Palette* and change the available fonts from the main menu.

The software sports some interesting and useful features not generally available on screen-drawing programs. When certain options are selected from the menu, a hollow box sprouts from the cursor position. The cursor keys adjust this box until it has surrounded the area of the drawing you want to manipu-

late, which could be the whole screen or only a very small portion of it. You can move or copy this area, as well as scale it up to 32 times larger or down to 1/32 of its original size. You can even rotate the boxed part of your drawing. Once the hollow box surrounds the object and the cursor is positioned at a corner of the box, the box can be pushed around to an position desired. You can scale and rotate objects at the same time.

Another potentially useful feature is *PC Palette's* graph-drawing ability. *PC Palette* will plot numerical information from any ASCII file as a pie, curve, bar, or dot chart. You can have up to 250 numerical en-

tries for each chart and plot two files against each other as a stacked bar chart.

try to make one yourself. A light mood to the writing makes it easy to read, but the technical information is complete. For instance, there's a good discussion of file structures that helps explain how screen information is stored. Also included are examples of display language for "slide show" production and sample BASIC programs that integrate *PC Palette* screen images into other programs.

PC Palette supports both monochrome and color displays, but it is really a color package. The command panel is noticeably easier to interpret in color, and the drawings you create in color are much more satisfying than the ones in monochrome. You'll get along better with a mouse or some other input device, too. All the features of the package are available with the PC's keyboard, but detailed cursor movements are difficult and cumbersome. After a little practice with a mouse, however, software control should feel more natural.

Image detail is excellent. Quality is so good you'll find yourself amazed at the range of possibilities you can create with the graphics capabilities of your IBM PC. But beware! The software has a perplexing propensity to lock up during certain operations if you touch keyboard keys while using the mouse.

PC Palette is fun. There's a lot of personal satisfaction in creating your own images and playing with them, and *PC Palette* makes this fairly easy to do. With its advanced features such as graph drawing, scaling, rotation, and superior text handling, *PC Palette* is designed for anyone who needs to incorporate graphics screen images into other software. But it can also serve as a training tool for computer graphics in general and IBM PC screen capabilities in particular. *PC Palette* is well executed and documented. It is functional, powerful, and easy to use. With its reasonable price (\$39.95), these features make it a good choice for anyone who needs to use or learn about computer color graphics. ■

For Your Information

About 15K of disk space is required to store each screen image. However, you can save space by storing some graphics as "stroke" files that remember the exact keystrokes used to create the saved image. The package includes a programming language of sorts that helps you create a slide show of stored images. With proper image manipulation, you can create animation-like sequences for training or emphasis. For example, numerical graphics can be displayed sequentially, overlaid, or made to change dynamically as the program reads different figures.

The documentation with *PC Palette* is stored on disk; if you

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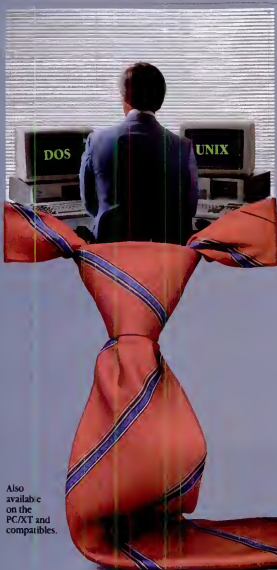
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PRODUCT REVIEW

MacPaint vs. ColorPaint: An Artist's Appraisal

BY TOM CHRISTOPHER

(Editor's Note: When IBM announced "improvements" designed to make its PCjr a more attractive computer, it also introduced *ColorPaint*, a cartridge-based graphics program. We were instantly struck by the similarity to *MacPaint* and asked New York-based computer artist Tom Christopher to compare the two. Christopher has just completed a book on the Macintosh and has written extensively on the graphics capabilities of the IBM family of personal computers.) The key to both IBM's *ColorPaint* and Apple's *MacPaint* programs is the visual accessibility of their commands. *ColorPaint* for the PCjr copied the Macintosh's *MacPaint*, but *MacPaint* got the idea from Xerox's Palo Alto Research Center (PARC), where it was originally developed. Nonetheless, it remains a very good idea.

Instead of constantly clearing the working screen to call up menus and functions, you use a mouse to pull them down from above the working area. The mouse also moves icons onto the screen from the left. This visual accessibility makes the programs easy to learn and almost impossible to forget.

Both systems use similar icons. In *ColorPaint*, you use a scroll icon to move the windowed drawing area. On a personal level, this is what I like about the IBM product. "Scrolls" scroll and are indicated by an arrow for the direction, not a little hand called "The Grabber," as in *MacPaint*. The IBM zoom is called "Zoom," not "Fatbits," and menu tools are referred to as such, not as items from the "Goodies" file. I'm kind of surprised Apple didn't program Chips Ahoy to pop out of the disk drive after correct



Artist Tom Christopher's rendering of a bottle of ink using Apple's *MacPaint* program on a Macintosh computer. "MacPaint lets you draw in any color that you wish," he notes, "just as long as it is black."

prompts. If you don't let its terms get in your way, though, *MacPaint* is a good system. Of course, *ColorPaint* is also a good system. It lacks some of *MacPaint*'s functions but it compensates by being in color.

Drawing Comparisons

Using a PC mouse on the PCjr, the cursor doesn't move as quickly as it does on the Macintosh. Also, in *ColorPaint*, it takes more physical room to move the cursor across the screen than the mouse pad will allow. You have to get used to lifting and repositioning.

Many things do work in the same manner on both systems: the freehand drawing mode, automatic straight lines, erasing, airbrushing, and fill are all very

similar. The IBM product also has a *CONSTRAIN* command to create perfect circles and squares, as well as oval and rectangle commands. *MacPaint* does not, making it hard to tell when a circle is absolutely round or a rectangle is truly a square.

With *ColorPaint*, you can selectively erase in line, freehand drawing, and airbrush modes. For example, if you are airbrushing over a pattern, as long as you stay in the airbrush mode, you can go back and remove parts or all of what you have done without disturbing the underlying work. You can't do this with *MacPaint*.

On a typical monitor hooked up to a PCjr, the *ColorPaint* working area is larger and easier to see than the legal-postcard size of the *MacPaint* window. The zoomed pixels on *MacPaint* are square and separated by thin white lines forming a grid. On *ColorPaint*, the pixels are rectangular and fit together flush.

Despite its silly terminology, the Macintosh *MacPaint* is quite serious about type. Its seven fonts can also be boldfaced, italicized, outlined, shadowed, or underlined; aligned flush right, flush left, or centered; and sized in a range from 8 point to 72 point. *ColorPaint* offers four type styles in small, medium, and large.

Both systems have a dotted-rectangle function for flipping things on an x or y axis, thus creating negative images, but *MacPaint* also allows you to expand, shrink, stretch, and condense the image.

As you may have guessed, IBM's *ColorPaint* lets you draw and form designs in color. Most graphic work is done in color, and all computer graphic systems should eventually address the problems of color. *ColorPaint* does so now, offering four colors at one time. You can change the palette to gain access to another set of four colors. And, with luck and skill, you can create the illusion of still more colors by juxtaposing two colors to create a third.

With apologies to Henry Ford, *MacPaint* lets you draw in any color that you wish, just as long as it is black. ■

Lighter Side of Number Crunching

A recent tactic in IBM's belated courtship of the scientific workstation market was its publication of a catalog of *Engineering and Scientific Programs for IBM Personal Computers*. This book includes thorough descriptions of over 340 pieces of PC software available from sources other than IBM.

These programs are built for serious number crunching, but a few have whimsical names, such as *DiscoSpecs* and *Units! Units! Units!* Other programs do exactly what they say. *Tilt-wall* helps design tilt-up concrete walls. *Leachi* is an aid in petroleum extraction. And *Bacfire* analyzes system failure.

DECLUST, however, doesn't tap into modems to get the inside dope on Washington sex scandals; it aids geologists by declustering closely spaced drill hole sample data. *VINO* probably isn't used by computerized enologists; the name stands for *Visual Interactive Optimizer*, a program that optimizes spreadsheets through linear programming. And *MicroCHESS* simulates control processes for a factory with up to 50 pieces of equipment.

Did you get a kick out of Apple's ads that showed a tennis shoe designed with *MacPaint*? There's a program called *Footware Design System* that makes the PC run rings around the Mac. It better, since the software costs \$20,000!

Attention oxymoron fans! The catalog even lists a piece of vaporware: *Streamcalc*, which does thermodynamic calculations.

The 400-page directory costs \$10.95 and is available through most IBM sales channels. For more information, write to IBM Corporation, P.O. Box 1328, Internal ZIP 4642, Boca Raton, FL 33432.

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OPINION

Thinking About Idea Processors

Outlining your ideas is not new, nor are these new programs all that revolutionary.

BY JARED TAYLOR

NEW YORK—"About the only thing a personal computer can do for an executive is turn him into a secretary or an accountant." At least, so says John Brockman, a New York-based literary and software agent who has seen a great many programs.

Brockman has a point. Hot-shot executives may think it looks sharp to have a PC or AT on their desks, but how much time are they going to spend entering spreadsheet formulas, sorting database records, or justifying on-screen boldface text? Not much. They'll still make the decisions, but some grunt down the hall will do the

real computer work. Many managers don't even dial their own telephones; why would they punch a keyboard?

Computers are wonderful, but most of what they do is low-level work. The real "thinking" doesn't involve the computer at all. In fact, it's all over by the time the boss says he wants a 4-year sales projection based on past performance and weighted by GNP forecasts. After that, it's all drudge work and thumbing through the manual. No fast-tracker is going to waste time doing that.

Neal Larson, the president of Living Videotext, puts it this way. "Most software available

today helps you do the jobs delegated to you. If you're the guy writing *dBASE II* code, chances are you're not the one who decided what needed to go into the database—or how."

Thought Provoking

Larson's concern is not an idle one. His company sells a program, *MaxThink*, and claims that it can help you conceive new projects, not just execute them. *MaxThink* is said to "enhance your creativity and imagination" and "introduce you to new ways of thinking." It's designed to be a tool for the thinker, not the worker.

Unfortunately, *MaxThink* doesn't live up to these claims. The program is little more than a fancy outline processor, and those have been around for a while. *ThinkTank* was one of the first, and Ashton Tate's *Framework* has one built into its word processor. They all make inflated claims.

Just what are outline processors? They are specialized word processors that help you organize topics and subtopics into the hierarchical outline format you learned in high school. And, they're pretty good at that. You can easily add and subtract topics, copy them, or move them around. Your outline can have as many levels of hierarchy as you want, and the program keeps track of the indentation and numbering.

Outline processors also let you expand or contract the outline. If, for example, you want just the big picture, you can get rid of subtopics and sub-subtopics and look only at the major headings. Or, you can pick any heading and display its subtopics. They are quite useful for

people who write a lot of outlines. But then, how many people write outlines for a living?

Thinking It Through

The hype artists, who insist on calling them "thought processors" make outlandish claims for outline processors because they're meant to be used at the thinking stage of a project. If you must draw up the original sketch of a sales campaign or a staffing plan, you can't delegate the job. An outline processor can help you get your thoughts on paper, and it is closer to conception than execution. But can it help you think?

MaxThink's colorful claims are based, in part, on its slick sorting routines. According to your instructions, the program will alphabetize, categorize, assign priorities to, and even randomly list topics under the same heading. This can sometimes be useful, but it's hardly revolutionary. And you, not the computer, still have to think up the categories and priorities. Larson is correct in pointing out the huge vacuum of real executive-level programs; he just hasn't filled it yet.

The day will surely come when computers help us think. On that day, you will feed raw data on a problem into your machine, and it will look for patterns, draw conclusions, and suggest answers. It might even write outlines. Expert systems and other artificial intelligence programs are already headed that way.

In the meantime, don't let the hoopla over "thought processors" fool you. Software may help you organize your thoughts, but you have to have a few to start with. ■



Illustration by Raymond Kachigian

Speaking of Computers: LEDites not Luddites

"But now we live, we are told, in the Computer Age. What is the outlook for Luddite sensibility? Will mainframes attract the same hostile attention as knitting frames once did? I really doubt it. Writers of all descriptions are stampeding to buy word processors. Machines have already become so user-friendly that even the most unreconstructed of Luddites can be charmed into laying down the old sledgehammer and stroking a few keys instead."

Thomas Pynchon, "Is it O.K. to Be a Luddite?"
The New York Times Book Review, October 28, 1984

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CIRCLE 136 ON READER SERVICE CARD

Take Two Disks and Call Me in the Morning

Self-help disks aid home health field.

BY JEFFREY LENER

One of the fastest-growing segments of the burgeoning self-care industry is home healthcare software. A California market research firm, Creative Strategies International, claims that by 1990 consumers will be spending \$10 billion a year for medical self-care equipment.

Prohibitive medical costs are one reason, notes James M. Sweeney, president of Home Health Care of America. "Over the next decade, we're going to see people saving billions of dollars by treating themselves at home." Anatomical autonomy is another factor. Robert George, principal author of the CSI report, says, "People sim-

ply want more control over all aspects of their lives, including their health."

Nutrition and Exercise

The physical fitness craze, when coupled with computer technology, has yielded an entire medicine chest of pertinent PC programs.

Some packages are just computerized diet books. Others regulate your regimen of running. The best are those that provide an analysis of nutritional intake and an explanation of suitable exercises for energy expenditure. *Healthaide*, created by Knossos, Inc., and now owned and marketed by Pro-

gramming Technology Corporation, of San Rafael, Calif., offers this and much more.

Healthaide helps you craft and coordinate a comprehensive plan of diet and exercise to fit your own personal needs and goals. Interesting relationships, such as salt versus blood pressure, can be plotted and printed out. And, from the database of 700 foods and 150 activities, you can balance what you eat and what you do to determine what you are, and what you can become.

More sophisticated than some of its competitors, *Healthaide* is subject to a few operational problems. But, once these minor kinks and quirks are worked out, you can harvest a cornucopia of fruitful facts and formulas.

Wellness Assessment

Broader gauges of physical well-being are also available. About 30 Health Hazard Appraisal programs are on the market, most of which are based on

the Centers for Disease Control's adaptation of the work of Dr. Lou Robbins of the Methodist Hospital, in Indianapolis. Representative of this kind of software is the Future Health series of computerized questionnaires that were created by the Institute for Lifestyle Improvement, which is affiliated with the University of Wisconsin-Stevens Point.

Compute-A-Life delves into your physical, psychological, social, legal, and moral history. It then calculates your life expectancy, lists your Top 10 potential causes of death, and makes appropriate recommendations to change your lifestyle and prolong your life.

TestWell is a similar educational tool that covers such areas as emotional awareness and control, intellectual and occupational conditions, and spiritual dimensions.

StressAssess measures the major sources and symptoms of stress in your life, explains how

(continued on next page)

Software Pharmacy

You don't need a note from your doctor to buy these home healthcare programs.

<i>Compute-A-Life</i>	\$449	<i>An Apple A Day</i>	\$99.95
<i>TestWell</i>	\$300	<i>Avant-Garde</i>	
<i>StressAssess</i>	\$400	1907 Garden Ave.	
<i>Why Smoke</i>	\$75	Eugene, OR 97403	
The Institute For Lifestyle Improvement		(503) 345-3043	
Dezell Hall		<i>Healthaide</i>	\$450
University of Wisconsin-Stevens Point		Programming Technology Corp.	
Stevens Point, WI 54481		7 San Marcos Pl.	
<i>How Fat</i>	\$450	San Rafael, CA 94901	
<i>Hearthrob</i>	\$150	(415) 485-5601	
<i>Lifescan</i>	\$500	<i>Relax</i>	\$139.95
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Sebring, OH 44672		Richmond, CA 94804	
(216) 938-9434		(415) 527-7751	
<i>Micro-HRA</i>	\$95	<i>Coping With Stress</i>	\$89.95
<i>Why Do I Smoke?</i>	\$95	<i>Handling Depressed Feelings</i>	\$89.95
Planetree Medical Systems		<i>Treating Erection Problems</i>	\$89.95
870 E. 9400 S., #104		Psycomp	
Sandy, UT 84070		P.O. Box 994	
(801) 572-1419		Woodland Hills, CA 91367	
		(818) 992-4884	

Take Two Disks (continued)

different people react to stress, and provides effective methods for combating this menace. *Why Smoke*, a very simple program, identifies the relative importance of six factors that contribute to a smoker's choice.

Fat calculators make up another big area of self-help software. Lifestyle Improvement Progress and Systems' (LIPS) *How Fat?* claims to determine the percentage of your body fat just by entering your circumference.

Another program from LIPS uses realistic graphics to promote good health at home. *Hearthrob* depicts a heart on-screen, beating at the same rate as yours. Then it shows a normal heart, calculates the extra beats yours takes, and offers strategies to bridge the gap.

Someday soon, "computer housecalls" may be possible, linking homebound or chronically ill end users with their

doctors. You will carry a "smart-card," a palm-sized device containing your entire family and medical history. But, until then, PC users will have to settle for programs like *An Apple A Day* by Avant-Garde, of Eugene, Oreg.

Health Advice

This program includes three parts, two of which are useful but dull. The more interesting part is the Health Advice section.

By scrolling through the screen menus, you can select any of 46 common maladies, from acne to venereal disease, and explore the ramifications of that ailment. You answer questions about your symptoms, and, by zeroing in on the particular problem, you can decide whether self-care or professional help is warranted.

The language is intelligent and straightforward and always defers to a physician's more pre-

cise judgment. The dialogue is usually dispassionate but occasionally becomes alarmist.

An Apple A Day is quite moral (for VD: "Avoid sexual intercourse and inform your partner"), modern ("Avoid feminine hygiene sprays"), a bit commercial (for jock itch: "Buy Tinactin"), and always supportive of the paranoid and uninformed ("Just remember that acne is not a sign of moral decay or unsavory habits. It is almost universal among teenagers and will go away even if nothing is done.")

Perhaps the most important feature is the set of suggestions to prevent disease and minimize problems in the future.

Psychosoft

Relatively few software applications concentrate on mental rather than physical wellness, but these might be the most interesting. Psychomp, of Woodland Hills, Calif., publishes *Coping with Stress, Handling*

Depressed Feelings, and Treating Erection Problems; these three programs offer what founder Dr. Robert Reitman calls "psychological self-help for the masses of people who might otherwise not have pursued the needed therapy" (see PC, Volume 3 Number 15, page 62).

Synapse Software, of Richmond, Calif., has introduced *Relax: The Stress Reduction System*, which allows you to monitor and control your stress levels through biofeedback. And, Dr. Timothy Leary, through his company, Futique, is close to releasing the first of a line of "self-development interactive software."

Futique's software is based on its SKIPI, or Super Knowledge Information Processing Intelligence, program, which is derived from sophisticated digital psychometrics. The bottom line is: "You learn how to construct and change your own personality," says Leary. ■

PRODUCT REVIEW

The Solid Gold Calculator

IBM's *Sci-Calc* is a functional program of dubious utility.

BY TOM BADGETT

Sci-Calc

IBM Personally Developed Software
P.O. Box 3280
Wallingford, CT 06494
(800) 426-7279

List Price: \$24.95

Requires: 128K RAM, one double-sided disk drive, 80-column display.

There must be a good reason for turning a \$3,000 computer into a hand-held calculator, but nine out of ten people probably don't know what it is. IBM's *Sci-Calc* utility makes any PC or compatible computer a powerful, programmable, scientific calculator, similar to the Texas Instruments TI-66 or the Hewlett-Packard HP-11C, both available for less than \$75. *Sci-Calc* works as well as these hand-helds—even better on some functions—but, in addition to costing \$2,925 more, it takes up

3 square feet of desk space, weighs at least 30 pounds, and requires 110 volts AC.

There are some advantages to *Sci-Calc*, of course. The software simultaneously displays a Result Register, analogous to the X register display of the handhelds, a Last Result (Last x), the four stack registers, and all ten memories. A two-line prompt is continuously displayed along the bottom of the screen to help you use the PC's function keys. And, on-line help is always just a keystroke away. The calculator uses the sometimes controversial Reverse Polish Notation (RPN) entry scheme, the only convenient method for complex calculations. Try it, you'll like it.

Ups and Downs

The *Sci-Calc* calculator is easy to program with a text editor. It stores and retrieves pro-

grams by name, so running any program is as simple as typing the name. The program mode lets you include input prompts so the user knows exactly what values are expected at each stage of program execution. A single-step mode helps with the debugging process. Up to 1,000 steps are possible in each program, and the number of programs is limited only by available disk space. You can't nest programs, however.

A software library is included with the program, but the routines we tried were wildly inaccurate. The SAVING program says \$100 deposited each month for 5 years at 5 percent interest will yield \$37,126.29. At who's bank? After that welcome surprise, the MORTGAGE program gave the depressing news that a \$2,500 loan for 3 years at 12 percent interest will cost \$305.16 per month. That proba-

bly explains how the bank can pay such high savings returns. These obviously are simple errors in the program steps, not problems with the calculator program itself, but you would expect such simple samples to work properly.

Fit Features

A separate file stores frequently used program constants by name, so you can easily call for Avogadro's number, Boltzmann's constant, or the speed of light in furlongs per fortnight. Up to 20 of these constants can be stored at a time. You can edit or add to the list from inside the *Sci-Calc* program. A plus for math or engineering users: the software will handle complex numbers, those with imaginary or nonzero components.

If your job requires hours of sophisticated calculations in a lab or office environment—enough heavy use to justify typing up a computer for the calculator function alone—then *Sci-Calc* may be for you. Otherwise, it's like the ubiquitous checkbook balancing program, an idea that sounds good...until you think about it. ■

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sheet programs become a snap because you don't have to constantly change over from number entry to cursor control. Unlike the Keytronics KBS151™, our "CONTROL" key has not been orphaned off to left field. The key is adjacent to the "A" key. Wordstar™ users won't need the hands of a basketball player to reach it.

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CIRCLE 384 ON READER SERVICE CARD

ANALYSIS

Can Integrated Software Coexist with Windows?

Experts foresee a market for both.

BY WINN L. ROSCH

The one likely casualty in window wars would seem to be integrated software. Once you can brew together your own mix of favorite programs—the spreadsheet, word processor, database, and communications package of your dreams—there seems little need for jack-of-all-trades program that cannot possibly hope to master all fields.

However, most experts think that while the future of integrated programs is far from assured, it's not likely to fall to pieces tomorrow.

"The future of integration is great," notes Esther Dyson, president of industry-watcher EDventures, Inc. "But all-in-one packages won't be great."

Component Systems

"I think we'll see the reverse of the current trend in integrated software," notes Curt A. Monash, software industry analyst and vice-president of Paine Webber. "Software will become like stereo equipment—the low end will be integrated and the high end will be components. The high end is features-sensitive; the low end more dependent on price."

Despite the mix-and-match abilities of the windowing system, integrated software systems still retain a triumvirate of advantages—an integrated package is easy to buy and handle—everything you need to compute is in just one box.

However, for sophisticated "power-users," those who want the utmost in performance no matter what the cost, windowing is the best bet. And windowing systems can give the power user all the productivity increasing benefits of integrated software while throwing in background processing of CPU-intensive jobs and eliminating the locked-in confines inherent in any product designed primarily to please the entire world.

Even Windows-developer Microsoft does not believe the company's promised product will eliminate integrated packages. "The Windows environment in no way, shape, or form spells the end of integrated software," comments Steven A. Ballmer, vice-president of systems software at Microsoft.

That's not to say that the integrated software of the future will be the same as it is today. Notes Ballmer. "I see integrated software and Windows co-existing, but I think developers will stop trying to force things that don't match the primary meta-

phor of their program into their software. No single integrated package can do everything."

Though integrated software won't be challenged by windowing in the near term, the far future is more questionable.

"The peak in sales of *Symphony* will come after the introduction of the windowing packages, not before," says Monash. "Eventually, however, it will be superseded."

"*Framework and Symphony* will be around for quite a while, but they'll likely be the last of their breed," says Tom Byers of Digital Research Incorporated. "The software world is ready to move on. For the future, we're looking at an improved user interface with lean-and-mean graphics and artificial-intelligence boundaries."

But neither will integrating environments be the last battle. "Just because the genuine office integration has been slower in arriving than expected doesn't mean that it isn't coming," Monash observes. "To me, the future looks a lot like a LAN or minicomputer." ■

Calendar of Events

DATE	EVENT	COMMENT	LOCATION	CONTACT
January 23-25	UNIX-Concepts/ Functions/ Applications	Detailed seminars discussing UNIX and C.	Sheraton Inn Pittsburgh, PA	The American Institute For Professional Education 100 Kings Rd. Madison, NJ 07940 (201) 377-7400
January 24-25	Local Area Communications Conference	Examination of LANs and other information processing technologies.	Marriott Harbor Beach Ft. Lauderdale, FL	Gartner Group, Inc. 72 Cummings Point Rd. P.O. Box 10212 Stamford, CT 06904 (203) 964-0096
February 4-6	Advanced Features of the C Language	Intensive seminar for C programmers.	Holiday Inn-Crowne Plaza Washington, DC	Institute for Advanced Technology 6003 Executive Blvd. Rockville, MD 20852 (800) 638-6590 (301) 468-8576
February 16-20	The International Software Update II	Discussions of international and domestic software standards, marketing strategies, and more.	The Waiohale Resort Kauai, Hawaii	The International Microcomputer Industries Association 21 Tamal Vista Blvd. Suite 175 Corte Madera, CA 94925 (800) 732-2300 (415) 924-1194 (in CA)

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CIRCLE 166 ON READER SERVICE CARD

People in the News: Edward Esber

Ashton-Tate's new president is a climber with his sights set on the multitasking mountaintop.

BY CHARLES BERMANT AND DON KENNEDY

You might say Ed Esber is on the fast track. In March of last year he joined the staff at Ashton-Tate, the Culver City, Calif. company that sells *dBASE II*, *dBASE III*, and *Framework*. Eight months later, David Cole had resigned and Edward M. Esber, age 32, was named president and chief executive officer of the 450-employee firm that is generally judged to be among the top three independent software publishers.

Esber, it should be pointed out, is no Johnny-come-lately interloper into the world of microcomputers; he's not some upstart MBA stepping in to reap the rewards of others' risks. He has toiled in the vineyards of such micro magnates as VisiCorp, Texas Instruments, and IBM. His association with IBM began when he worked on one of the development teams considering production of a personal computer. Esber's group, incidentally, was not chosen.

Great Expectations

Esber's association with Ashton-Tate extends back only a few months, but already he sounds downright apostolic when he talks about his company. Ask him about *Framework*, and he'll tell you how good it is. Ask him about *dBASE III*, and he'll sing its praises. Ask him about *dBASE II*, and he'll tell you how tough and persevering "that sucker" is. Ask him about *Friday*, and...well, even apostles can only preach the gospel.

Framework, of course, is currently Ashton-Tate's most closely scrutinized offering. The industry and the press have tended to picture it as the company's weapon in a titanic struggle with Lotus, which is swinging the sword of *Symphony*. The image is of two of the giants of the software industry battling for market supremacy with their integrated software. So far, it is

also an image of *Symphony* rubbing *Framework*'s nose in the dirt, at least in the area of sales.

Not quite so, says Esber. He admits that *Framework* has not met "some of the expectations of



individuals in our own company." However, he adds that Ashton-Tate's investment in *Framework* "has been paid back already. We and Lotus have been guilty of not managing the financial expectations of the press, he says. By any conventional measurements, *Framework* and *Symphony* are both successes."

He also admits that Lotus's product has outsold his own, "probably 2 to 4 times." However, he feels there is a good explanation. "The sales of *Symphony* are more of a tribute to 1-2-3 than a testament to its own attributes," he says. "It has taken us longer to get our distribution, as Lotus has a distribution advantage. But I expect their bad reviews to eventually catch up with them, as our good reviews will catch up with us."

Esber's recollection of the reviews for the two products may be selective, but he clearly relishes the press coverage of the *Symphony-Framework* faceoff. He enjoys it so much, in fact, that he takes credit for it. "It is questionable," he says, "if we would have got such close scrutiny of the products—such pub-

lic relations value—if that battle had not been orchestrated."

When asked how he could have "orchestrated" a situation that has become the cover story of most major computer publications this year, he smiles somewhat sheepishly and asks, "Well, who announced later? Who created the drama?" The answer, needless to say, is Ashton-Tate.

If "drama" does indeed describe the competition between the two products, then the first act belongs to *Symphony*. Esber, however, expects a change of fortune for *Framework* by the time the curtain sets on the next act. He points to the fact that 1-2-3 replaced *VisiCalc* as the best-selling spreadsheet and feels that it sets a precedent for his belief that Ashton-Tate's integrated product can still become number one.

The tricky part for Esber, of course, is not merely becoming number one in integrated software against Lotus, but battling other forces, such as IBM's entry into the software market and the movement toward multitasking environments that will render integrated software unnecessary.

Water Works

Earlier this year, IBM created a splash in the software waters with the introduction of its Personal Decision series and Business Management series software; modular-style programs based on minicomputer and mainframe code already in use. Esber dismisses IBM's effort with a wave of his hand. "I am glad it has chosen products in the latter stages of their life as a target for its entry into the market," he says.

Windows are dismissed almost as derisively. "How many times do you not work full screen?" he asks. "The only time windows are used is when

a software publisher wants to demonstrate his program and show you his spreadsheet and word processing programs side by side. The reality is it's only used when some software vendor is displaying it."

Speaking of *TopView*, he says, "IBM is moving its operating systems in the direction of Apple's pioneering. It's not important to support *TopView*. Nothing will force people to use *TopView*, unless it is bundled with the machines. But bundling doesn't work because people don't like to be locked into software."

Market Matters

Of course, all the emphasis on Ashton-Tate as an underdog in the *Symphony-Framework* war paints an unbalanced picture of the company that has been the top dog in database management since such programs became a staple on the PC. *dBASE II* and now *dBASE III* are the standards against which all other databases have been judged, and Ashton-Tate has shown no sign of losing its edge in that market.

When speaking of *Framework*, Ed Esber says he knows how to become number one. Just as importantly, with *dBASE II* and *III* he claims he also understands how to remain number one. For this, he lists four rules: "Keep your product competitive. Keep listening to your dealers. Never get too arrogant. Never believe your own b.s."

From a man who talks about orchestrating the media and managing their expectations, that final rule may well give pause as to just how many grains of salt should be taken with Ed Esber's words. However, one thing seems certain. He's on a track that is fast and certainly seems headed towards the top part of the heap. ■

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INTEGRATION OF FUNCTIONS <ul style="list-style-type: none"> All tools work together—All information is shared automatically or can be transferred instantly between tools All tools use free-form storage All tools are fully user-tailorable Notes—can be filed as appointments, or attached to calculations, reports or other notes Telephone dialer—searches file for phone number then dials Alarm Clock—triggers note recall when appointment comes up on calendar 	NO integration	NO integration	Partial integration—cut-and-paste required
CONCURRENCY <ul style="list-style-type: none"> META—co-resides in memory with other programs Full one-touch program switching Appointments chime through other applications 	LIMITED. Will not chime through other applications	LIMITED. Must load and quit from each function each time.	NO CONCURRENCY

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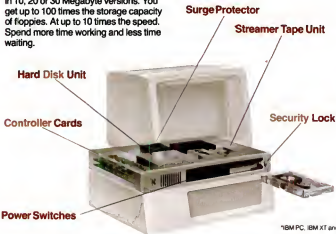
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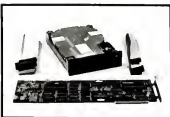
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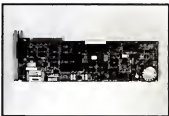


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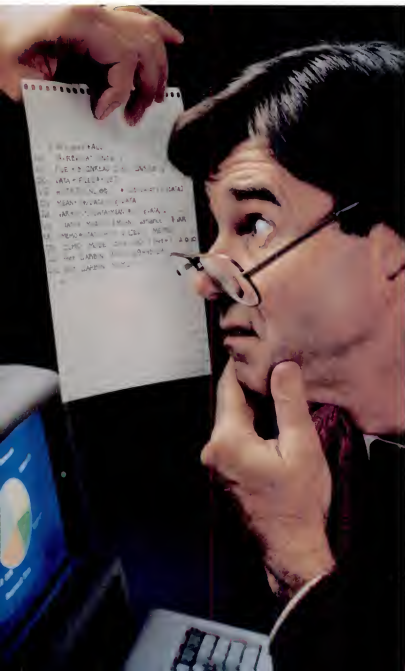
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Are They Clean?

Users who make illegal copies aren't the only ones with dirty hands. Software producers have gone too far with strong-arm licensing agreements and excessively restrictive copy protection.

Editor Bill Machrone proclaimed in this space several months ago, "We're clean" (*PC* Volume 3 Number 16). What he meant, of course, was that *PC* had bought, not made, enough copies of the software we use regularly in the office so that each staff member can have a paid-for original. Bill's announcement constituted public recognition of an important principle: Software manufacturers have a perfect right to be paid for the fruits of their creativity.

That statement doesn't tell the whole story, however. Software producers themselves have dirty hands. In their eagerness to prevent any unfair use of their products, they have sought to go beyond the copyright protection for intellectual property. The so-called "tear-me-open license agreement" and the various methods of copy protection are not the tactics of saints.

License—Sez Who?

Most people (myself included) almost automatically throw out the license agreement/registration card that comes in a software package. It takes two lawyers and a magnifying glass to read, for one thing. For another, it typically claims that the manufacturer, not you, owns the disk you thought you just bought; that you alone are authorized to

use it; and that your use is limited to a single computer and/or a single location. Your signing and returning the card, of course, means that you have agreed to these restrictions, but since the manufac-



Craig Stark

turers know you most likely won't do this, they further claim that if you even so much as open the package, you have given your tacit agreement.

What kind of nonsense is this? If I buy a copyrighted book, I own the volume, and so I can give or lend it to a friend or can even rent or sell it. Furthermore, if I buy a copyrighted record album, I can play it on either the stereo system in my basement or the one in my living room. And if I buy a copyrighted videotape, I can move the video deck's location to the

bedroom without having the copyright owner of the film seek to assert his rights there.

Licensing rather than buying software may be appropriate in the mainframe business, but it makes no sense for microcomputers and retail software distributors. In the few months I've been at *PC Magazine*, I've had at least six different computers in my office; I have one at home and use still another whose "location" is a moving commuter train. Would anyone say I should purchase different sets of software for each machine I use or test? Or again, if *PC* hires an office temporary to type entries into a database while a staff member is away on business or on vacation, does anyone seriously suppose that "cleanliness" demands that we buy this temp a fresh set of never-again-to-be-used software?

Moreover, if software manufacturers really meant their "license" claim to be taken seriously, they would insist on a signed agreement at the point of sale. A few, in fact, bravely do—which is why computer stores and mail-order companies don't want to carry their lines. Most of the rest, however, rely on the strong-arm "tear-me-open license," which is simply a form of commercial intimidation, is not enforced, and (in the opinion of at least one attorney I consulted) is simply not enforceable.

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EDITOR'S SCREEN

Copy Protection

Copy-protection systems are just another attempt by software producers to assert continuing control. In the interest

of fair trade, I think software producers who use it should place a prominent notice, "Copy-Protected Software Inside" on their package labels. But such a no-

tice, of course, might hurt prospective sales.

And it should. I won't buy a copy-protected program unless I know I can make backup copies of it as often as I deem adequate for my security. Important data, including the programs that run it, should periodically be freshly backed up. When I eventually report the details of what I paid for my house to the IRS, I do not intend to rely on the chemical and magnetic stability of a single 20-year-old floppy disk!

Even programs whose copy-protection scheme allows them to be loaded onto a hard disk usually "refer back" to drive A: to make sure you still have the manufacturer's piece of plastic. This scheme restricts your freedom to reconfigure your machine. In addition, that piece of plastic may become lost or too damaged to use at a time when the manufacturer has gone out of business or can't supply a fresh "factory" backup (Sunday at 5 a.m. or one hour before deadline are the kind of inopportune times that come to mind.)

Fair's Fair

The protection both the letter and the spirit of the copyright law affords is, I suggest, the reasonable meeting point between the producer and the purchaser of microcomputer software. Except in flagrant cases of software piracy, invoking the copyright law as such is impractically cumbersome. There is no acceptable way to prevent an occasional "irregular" copy.

Sharpening an individual's sense that it is wrong to copy either disks of Beethoven or *WordStar* for friends is not easy. But where moral suasion is required, no good result is likely in an atmosphere of hostility, and hostility is what copy protection and the "tear-me-open license" claim promotes. If software producers and end users together make a good faith resolution to respect each other's rights, perhaps all of us will emerge a little cleaner. ■

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A BUREAUCRAT'S GUIDE TO WORD PROCESSING

Now, if it were you or I and we wanted a word processing program for our IBM-type PC, we'd probably stop off at our local computer store and simply diddle with a few.

You and I, however, are not the U.S. Department of Agriculture.

(Nor any of its permutations of subsystems like the Economic Research Service, National Resources Economics Division, Data Services Center, etc., etc.)

So when the USDA told ERS to tell NRED and DSC to look into a truckload of w.p. programs for all their PCs, the last thing they wanted was simple diddling. Their dedicated Wangs and Lexitrons were far too few to handle their needs, their IBM® PCs weren't

THESE ARE THE PACKAGES THE COMMITTEE EVALUATED:



compatible with them anyway, and nobody really, quantifiably, knew from word processing with a personal computer.

Definitely not a diddling-mode condition.

As they put it in *The Exchange*, an internally distributed publication of the Department of Agriculture: "A needs assessment showed that, in the long-term, a word processing system is needed that can increase word processing capability and also be compatible with ERS' Long Range Information Management goals."

Well, "Needs assessment" led swiftly to "procurement action," which galloped into an "objective review" of the eight top-rated PC programs on the market (as compiled by *The Ratings Book* published by *Software Digest*), along with WordStar® and Display Write 2, because they had some around.

Thus armed with the names, the final evaluators (a team of secretaries from NRED who would be the primary users of the PC software) became armed with each of the programs, along with checklists to record such things as ease of use, advanced features, and similarity to their existing dedicated equipment.

Since NRED has some hard disk base systems, any packages that were copy-protected could

not be transferred to the hard disks, and were eliminated on that basis alone. OfficeWriter™ and SAMNA WORD™ II were the first to go.

Next, IBM's Display Write 2: because it's "not compatible with other software used in ERS (like Lotus® 1-2-3™, dBase II® etc.), and it's "full of confusing menu options and cryptic error messages." Au revoir IBM.

Then, three more, for a variety of reasons. Which left:

Volkswriter® Deluxe™
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Volkswriter® Deluxe? "Too complicated and confusing." Not "easy to learn or use."

MultiMate? Not bad. It actually tied the winner in a few categories.

The winner being the one that won 82% of the votes in the Ease of Use/Ease of Learning categories. The one about which they said, "The ability to store deleted text and automatic document backup features were both highly desirable." The one they thought they'd quickly "be able to use... for their day-to-day word processing tasks."

The whole process took some three months of work by people in DSC to support the NRED in its work with the ERS and DSC to make the world a better place for the USDA.

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Waiting for Quality Word Processing

The word processing market is long on quantity and short on quality. Dedicated systems developers must compensate and shift their focus to writing better software for PCs.

The personal computer industry could use a few good word processing programs. Ridiculous, you say, there are hundreds on the market already. Actually, there are hundreds of text editors but very few true word processors.

Text editors and word processors perform a similar function, but each approaches the task differently. The philosophies behind these two software siblings could be expressed thus: A text editor is designed to be an efficient program, whereas a word processor is designed to make its user more efficient. The software's effectiveness as a tool for getting a job done is often ignored by its developers in their efforts to make it faster and more efficient.

To make text processing programs efficient, some developers simply limit the available options; others design each function independently of other functions. When you change the margins, for example, centered text may suddenly become uncentered. If you move a paragraph, the proper placement—and even numbering—of footnotes may be affected. In such cases, you must manually make the corrections.

Most so-called word processing programs now on the market concentrate on individual functions. They almost entirely ignore user throughput, which has

long been the yardstick against which other information processing applications have been measured.

Only a few word processors of quality are currently on the market; we need



Said Mohammadioun

more. Why? Because good word processing software can help expand the overall PC market by selling more computers to potential users.

You may not want to and should not need to know more about computers than what is directly related to their application. To most word processing users, the hardware and software together are simply a tool. It is the result—the properly edited and formatted text—that is important to them. If the industry wants to sell to business executives, it must deliver a

product that meets these priorities.

The potential size of the word processing market is almost incalculably large: While nearly a million dedicated word processors have been sold, at least 80 percent of the people who deal with text are still using typewriters. The tremendous cost reduction that a personal computer offers opens up a vast market. All we need now are a few good word processors.

The best candidates to provide these word processors are companies that have spent years selling dedicated systems and learning how to make their users more efficient.

The growth in the dedicated word processor market has slowed substantially and may even be declining. It will be more and more difficult to sell dedicated machines when the competition is a personal computer that can do as good a job of word processing or better and is much cheaper. Dedicated word processor manufacturers can either face this increasing competition in a flat market or enter and help expand the already fast-growing PC market. With so many potential users waiting, the choice should be easy. ■

Said Mohammadioun is the founder and president of Samna Corporation, developers of the Samna word processing program.

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Letters to PC

Keying In on the AT's Features

I particularly enjoyed the article "IBM Brings Out the Big Guns" (PC, Volume 3 Number 22) because I am an IBM PC AT user. However, I do wish to take umbrage with the bit about wearing the key to attract females. The last thing I want is to be in a room with another woman and have the "room light glint mercilessly off the letters 'IBM' and into her eyes" (see "The Key to Status," pages 128-129).

PC Magazine—indeed, the industry as a whole—tends to lump males into the category of computer jock and females into the category of word processor user (read secretary). I am totally sold on the AT, just as I was on the XT. The key is an added security factor that I appreciate wholeheartedly—and it looks great with a sweater.

Marth Albertson
Newark, New Jersey

Paul Somerson replies:

Next time you're in New York, let's compare data.

I think that the writer of the article about the IBM PC AT had a bit too much champagne at the IBM shindig. In particular, the rampant adulation of the key lock on the AT was inappropriate and also dead wrong.

The circular key is not difficult to duplicate. Every locksmith I know in New York City can readily duplicate this key. Luckily, there are still some locksmiths that do not want to deal with that lock. They have the integrity to tell you that there is a tool that can pick these circular locks in under 5 minutes. You don't even have to be an experienced burglar to do it. I'm not certain, but I suspect this is why the phone company has removed the

circular locks from its pay-phone coin boxes.

I believe that users of the AT would be far better off with no lock than with an inadequate one that lulls them into a false sense of security. Perhaps the lock serves a purpose in preventing casual or inadvertent damage, but please don't advertise it as a deterrent to an experienced burglar or crafty lock-picker.

Edward J. Leary
New York, New York

Keep your eye on the donut, Mr. Leary, not the hole.—Ed.



At Competition

The inclusion of an AT&T PC 6300 and a Compaq Deskpro alongside the IBM PC AT for a speed comparison test would seem to be a logical choice (see sidebar to "IBM Brings Out the Big Guns," PC, Volume 3 Number 22, page 132). After all, the AT&T is widely viewed as the only significant big-league challenge to the AT. The Deskpro and the AT&T PC 6300 sport a true 16-bit, Intel 8086 processor. So far, so good. But why was the floppy drive version of the AT&T machine chosen rather than the hard disk version for competitive comparisons involving I/O operation? This choice wasn't explained. The Deskpro is a hard disk machine, and anyone contemplating

the purchase of a PC AT would not settle for a floppy drive alternative.

Nevertheless, the speed test chart does provide some interesting insights. On the test operations not using disk I/O (count to 10,000, sort records, and recalculate spreadsheets), the Deskpro and the AT&T 6300, while lacking the PC AT's muscles, are not left in the dust by it. The Deskpro and the AT&T provide substantially enhanced performance vis-a-vis the IBM PC and PC-XT. Although the AT may be up to twice as fast as the hard disk PC-XT on the tests with disk operations, these hard disk machines are a great improvement over the floppy drive PCs. On the read and write tests, the PC-XT and Deskpro were 12 to 15 times faster than the floppy drive machines. This may count for more in alleviating end-user frustration with PC I/O operations than the AT's improved performance.

Given the AT's current shortcomings in the areas of software compatibility and the amount of addressable memory of its MS-DOS operating system, the enhanced AT&T and Compaq hard disk compatibles may represent better price and performance solutions for many business environments.

Neville O'Reilly
East Brunswick, New Jersey

When AT&T introduced the 6300, it had agreed to an "exclusive" with Personal Computing magazine. As such, a hard disk machine was not available to us for comparative testing. We tracked down and purchased a dual-floppy machine, the only 6300 then for sale within several hundred miles of New York.

We quite agree about the desirability of the 6300 and the Deskpro. See our cover story on compatibles in the December 11 issue.—Ed.

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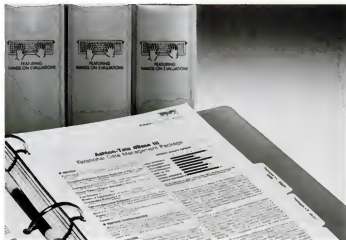
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LETTERS TO PC

Praline Prose

I had to check my calendar to make sure that it was really autumn upon us. After reading your article about the IBM PC AT, I thought it must be spring because the sap flowed so sweetly from the pages.

We have a famous hockey broadcaster in Canada who is well known for his expressions like "holy cow," "gee whiz," and "by gosh." But he doesn't hold a candle to your AT review, where objectivity just flew out the window.

I gather the AT is a pretty good machine, huh? And hey, this must be 1984 if you celebrate IBM's folksy double-speak as a "soiree."

As for the competition, you have been sitting in front of your VDTs for too long. How can you say the end is nigh for all those third parties? The little guys started the micro party in the first place. They will survive because they have to.

Brad Gibson

Hamilton, Ontario, Canada

We use only grade A Canadian maple syrup at PC; the domestic stuff is too rich for our underdeveloped tastes. Our reporter in Dallas, however, had no illusions about the real flavor of the meeting.—Ed.

Turbo Pascal Competition

While I share Jeff Duntemann's enthusiasm for Turbo Pascal, his review offers a slightly misleading view of the alterna-



tives ("Supercharged Turbo Pascal," PC, Volume 3 Number 22). He states that, to his knowledge, no other Pascal includes the functions VAL and STR:

Microsoft's Pascal includes ENCODE and DECODE, which do the same thing. Pascal VS on IBM mainframes (also usable on the IBM PC 370) includes READSTR and WRITESTR, which also have the same function.

Also, the use of dynamic strings is really not that unusual an extension.

F. James Rohlf

Stony Brook, New York

Ruffled Feathers

I have been a subscriber to PC Magazine for over a year, and I rate it as one of the best computer publications available. However, the letter from Victor Rosenberg in Letters to PC really ruffled my feathers, and I felt that I had to respond (PC, Volume 3 Number 22, page 95). The statements by Rosenberg reflect the arrogance displayed by a majority of software suppliers, whether they are vendors, manufacturers, or authors.

For over 20 years I have been watching the evolution of technology. It is distressing and unfortunate that in the haste to earn the sacrosanct dollar, companies have rushed hardware and software products to market. All too often these products are under-tested.

There was a time when you could buy a software package and have full confidence in the product. You hoped that your confidence would be rewarded in a quality product. Rosenberg's statement that "a customer has no more right to expect a perfect software product . . ." is a cop-out to mediocrity.

I agree that "beta testing, while good in theory, is never adequate." But the extent to which beta testing is utilized directly affects the quality of the finished product. Insufficient beta testing invariably results in a product that should not be released to the end user.

Rosenberg shows true naivete by stating "a vendor would like to check a review for accuracy." I assume that a reviewer checks his facts thoroughly before publication of the review and that any software or hardware failures trigger

a discussion with the manufacturer.

Again, PC is superb. Please keep up the good work.

Sy Fischthal

Flushing, New York

Needed: Bibliographical Database

The reviews of database programs were excellent ("Project: Database," PC, Volume 3 Numbers 11-17), although a bit of an overkill for those of us with very specific and concrete needs. Many people in my field (psychiatry and behavioral science) would find it of great value if you would have a specific listing and practical review of programs designed for maintaining, searching, and updating bibliographies. I understand several database programs may be useful for this, particularly those that permit variable-length fields to adapt to varying numbers of authors, lengths of titles, book references, and so on. Several details of such an application have been covered indirectly in your database reviews; however, articles specifically dedicated to this topic would be of value.

Harvey J. Karten, M.D.

Stony Brook, New York

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Predetermined Printer Preference

Certainly we all have prejudices regarding computer software and hardware, but M. David Stone obviously formed his opinion of the Epson FX-80 dot matrix printer before analyzing it for his review ("Dot Matrix Printers: Character Build-

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LETTERS TO PC

ing," *PC*, Volume 3 Number 23, page 151). Your readers deserve better than one-sided views to base their buying decisions on. Had I based my decision of which printer to buy on Stone's review of the FX-80, I would be without a very functional and practical piece of computer hardware.

Dallas Vordahl
Spokane, Washington

The issue of *PC* devoted to printers contains a lot of useful information. Naturally, I was curious to see how my printer fared in the evaluation. Unfortunately, it did not hold up too well.

However, I still do like my Epson FX 80, even though the reviewer, M. David Stone, did not. Pinfeed platens on any printer, including the recommended Okidata ML-92, require getting used to. Still, I can load paper into my FX-80 in 15 seconds.

Judging from the print samples that accompanied the reviews, Stone would not consider the printer quality readable for any of the printers under \$800.

Another problem was the inconsistent length of the reviews. The review of the Epson FX-80 occupies 10 column-inches compared to the 24 column-inches for the Okidata ML-92, yet the Epson has unmentioned features similar to many that were discussed for the Okidata. Stone also reviewed the Epson LQ-1500; he liked the comprehensive manual and separate reference card for the LQ-1500, but he did not like the comprehensive tutorial manual for the FX-80. He didn't even mention the FX-80's separate reference card.

Personally, I find that the download character set is necessary for the work that I do. The reference table of printer data does not distinguish between the download capabilities of printers. The FX-80 allows all 256 characters to be defined. The ML-92 allows only the 96 printable ASCII characters to be defined, and these are the only characters I don't need to change.

LETTERS TO PC

It would have been useful to have seen the samples of the nondefault print styles for the Epson LQ-1500 that Stone praised.

Murray Spencer
Gaithersburg, Maryland

Missing Departments

I was very disappointed with the issue of *PC Magazine* devoted exclusively to printers. Many of my favorite sections were missing: specifically, Programming, Languages, New on the Market, Telecommunications, and PC Arcade.

To top it off, User-to-User, PC Tutor, Norton Chronicles, and the Guest Editorial might well have been deleted since they related only to the cover story.

I wish that you had split the articles on printers into three parts and had run it in three successive issues. Then the missing columns could have been included as well as several other feature articles. I also noticed that the number of advertisements from printer manufacturers tripled. Is that the reason you sacrificed variety and published such a boring issue?

Perhaps the solution for me would be not to renew my subscription and just glance at the cover to determine if it is an issue worth buying.

Sheila Lipsey
Burlington, Iowa

PC Magazine is like the weather in Iowa: If it doesn't suit you, just wait two weeks and it'll change. —Ed.

Be Kind to My Eyes

Ergonomics should be applied to the production of magazines as well as to computer keyboards and screens. After all, most of us still get most of our information from the printed page.

In your issue on ergonomics, you introduced "Keyboard Ergonomics for IBMs" (*PC*, Volume 3 Number 19) with a page that is an example of marginal ergonomics. I am referring to your use of black type on a dark reddish-brown page printed on shiny paper. It looks like art



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LETTERS TO PC

considerations won out over readability.
With that exception, I enjoyed reading
the articles. Keep up the good work.

Rodney L. Wright
APO, New York

A Bleak Future

I noticed James Langdell's review of
Huang's I Ching, a fortune-telling pro-
gram for the IBM PC, in PC News
("Disk Changes PC into an Oracle,"
PC, Volume 3 Number 19, page 62). I'm
looking forward to hearing about how he
bought the Brooklyn Bridge and about
his investment plans for beachfront con-
dominiums in Omaha. But seriously, this
nonsense doesn't belong in your maga-
zine. Spending a lot of money for a
worthless program is bad enough, but
Langdell insults us further by accepting
its claim at face value.

James Steele
Manchester, New Hampshire

*Mr. Langdell says he feels a great pride
of ownership each morning, viewing the
East River skyline as he commutes into
Manhattan. He's now hard at work re-
viewing Three-Card Monte emulation
software, and he already owes his IBM
PC \$240.—Ed.*

Correction

The print samples for the Hewlett-
Packard LaserJet and the Diablo EPM-1
were inadvertently reversed on pages
394-5 ("Advanced Tech Print: Speeding
Ahead," PC, Volume 3 Number 23).

How to Write to PC

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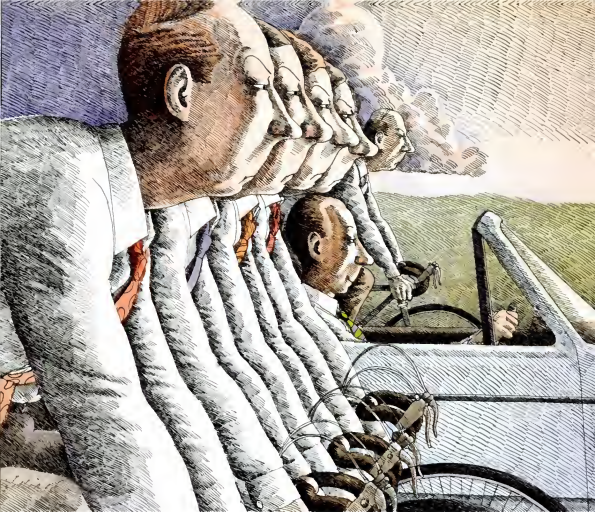
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A Serious Lap Computer at Last

The new Data General One may be the first full-function, PC-compatible lap-size machine, making it possible to use the same computer both on the road and at home.

Lap machines, portable computers you can fit into an attaché case and balance on your knees, have been drawing a lot of attention in recent months. These machines are designed to let us work under combat conditions, such as when we're commuting on the Long Island Railroad or eating airline food.

Early portables, such as the Osborne One and the Compaq, quickly earned the name that most of us now call them, luggables. The Compaq and the IBM Portable PC, as wonderful as they are, aren't portable: they are simply moveable, or luggable, and, at 33 pounds for the Compaq and 30 pounds for the IBM, no one but Arnold Schwarzenegger lookalikes would want to carry one around. (For a discussion of luggables, see "Inside the PC Portable" and "IBM Joins the Suitcase Set," *PC*, Volume 3 Number 10.)

The portable version of the TI Professional is even less portable than the others. The portable TI Pro doesn't have one handle on it, like the Compaq and the IBM Portable PC; it has two. I have the machine and know from personal experience why it has two handles: just like a heavy steamer trunk, the TI Pro is equipped with one handle for each person needed to carry it.

This class of machine solved the prob-

lem of moving a computer from office to office, across town, or across the country, but it failed to solve the problems of weight and size, and it did not address the occasional need to work with your com-



Peter Norton

puter on your lap.

The first batch of truly portable lap computers were, from the PC user's perspective, toy or play computers, most appropriate for note taking. I don't want to put down the usefulness of these machines—best typified by the Radio Shack Model 100—but none of them ever threatened to grow up and become a real computer. Many commentators have expressed the opinion that the natural users of these machines are journalists, and many journalists praise them, including

PC Magazine's editor, Bill Machrone.

Data General One

Can we get a full-function PC equivalent in a lap machine? The nifty Data General One computer may be just that. The appearance of the rumored IBM lap-topper would be more confirmation that such a computer can be made. Whether machines like the DG/1 are both "real" and useful as computers is worth pondering, because heavy PC users have a lot riding on the answer. If these machines deliver the goods, we may greatly benefit from having them; if they don't, we may waste thousands of dollars and too many hours learning that they're simply high-tech toys.

A full-function PC is sizable. It has a full-size, full-stroke keyboard, a full-size, 25-line screen, enough memory, enough disk storage, and enough battery life to get the job done. A full-function lap machine must also be IBM PC-compatible. If a computer isn't PC-compatible, it's not a computer; it's an exotic toy. Hewlett-Packard didn't understand this fact when it brought out its powerful lap machine. The HP Portable is indeed a wonder to behold, but without a full-size screen and PC compatibility, it's simply a toy.

It seems a contradiction to squeeze so many functions—PC compatibility, big

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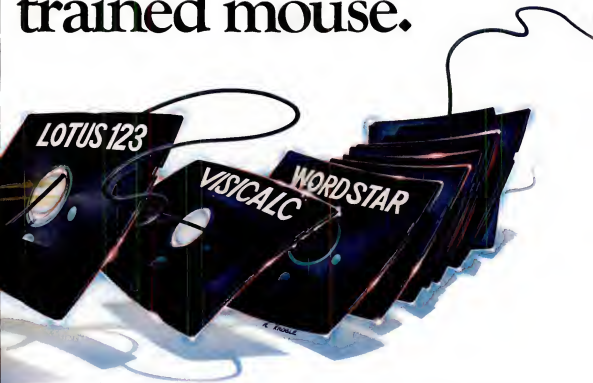
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screen, big keyboard, big memory, big disk storage, and, finally, big batteries—into a little lap-topper. The amazing thing is that Data General did it in the DG/1, and others will be sure to follow in its footsteps.

I've been using a DG/1 for quite some time (I received a prototype long before the machine was unveiled to the public). While the machine does have problems—the legibility of the screen isn't too good—this machine is not a toy; it's a full-fledged member of the PC family. You can take the DG/1 on the road and do PC-class work and use it as your one-and-only PC. I'm very impressed with the DG/1.

Disk Question

Unfortunately, the DG/1 has disk problems. The machine has nearly 1½ megabytes of disk storage when loaded with two disks; that's enough, under most circumstances, to eliminate the need to play the disk-shuffle game (switching disks in and out of the machine). But there's more to the disk question than that.

One crucial issue of lap computers is the disks they use. The DG/1 uses the Sony-type hard-shelled 3½-inch microfloppy disks, which hold the equivalent of two floppies. The smaller disks hold more because they are quad density, recording 80 tracks of data on a disk side. Standard PC floppies record only 40 tracks per side. You can expect that other lap PCs, whether from IBM, Compaq, or anybody else, will use similar microfloppies. Do these disks do the job adequately?

We should look at these microfloppies in lap machines the same way that we look at hard disk systems in a PC-XT or AT. Microfloppies in a lap computer, like hard disks in a desk computer, are working storage, not transfer storage. Transfer storage is used to bring newly bought programs to your computer and to pass data from machine to machine, unlike working storage, which you use to

work with programs and data on your computer.

If you have a hard disk drive, you don't buy programs on hard disk; you buy them on floppies and transfer them to your hard disk. If the programs aren't copy protected, you can work entirely off the hard disk. The situation is the same for a lap computer like the DG/1. Microfloppies are fine for use within the realm of the DG/1, but for connecting with the rest of the world, including using store-

While the DG/1
has problems—the
legibility of its
screen isn't too
good—this machine
is not a toy.

bought programs on the computer, conventional floppies are the only viable way to go.

Data General has misunderstood this simple fact because the company seems to be pouring quite a bit of effort into convincing software vendors to sell their programs on microfloppies. That's downright silly. Nobody wants to manufacture and sell software in a variety of media. Stores certainly don't want to tie up shelf space and complicate their inventory with multiple versions of the same program, especially when it can be avoided by stocking only the most popular version.

Can a computer like the DG/1 really be functional? We shouldn't consider buying a DG/1 or similar machine without getting an accessory 5¼-inch disk drive. The external disk drive stays at our base location, so we can transfer data to and from the lap computer's microfloppies, which we can freely move around with the lap computer and its little drives. Without the accessory 5¼-inch disk drive, a DG/1 lap computer isn't a full-

function PC any more than a Radio Shack Model 100 is.

A Moral Right

Copy protection is another consideration. A DG/1 is only useful if we can get the programs we use onto its disks. That means that either we don't use copy-protected programs, or we use ones that are also available on microfloppies. I expect that popular copy-protected programs—for example, Lotus's 1-2-3—will be available in special DG/1 editions, and that will make them usable. It'll be hard luck, though, for anyone who wants to use other copy-protected programs on a DG/1. And, if we already own a protected program that is available in DG/1 format, we'll have to buy another copy just to use it on the DG/1—that's a real nuisance, financially as well as psychologically.

Most users who buy all their programs and never touch pirated ones feel they have a moral right to use those programs on whatever machine they are working with, and I agree with them. Regardless of the legal phrasing that comes with a program, most of us feel that we've bought the right to any single-thread use of the program: use on one machine by many people, or many machines by one person. Any combination seems legitimate since the program isn't being used in two different places by two different people at the same time.

This commonsense understanding of our rights in using a program conflicts with the practical reality of copy protection when we work with different computer media. If we work with an XT's hard disk at our home base and with the DG/1's microfloppies on the road, it really butts into the copy-protection problem. The continued spread of useful computers, such as the DG/1 and the PC AT, that have different working disk media makes hard-nosed copy protection less and less viable. With any luck, we'll have to put up with less and less copy protection. ■

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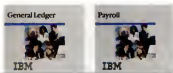
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Accounts Receivable for a clear picture of your open accounts to improve



The BMS programs work alone or as a team. You can start with one, such as *General Ledger* or *Payroll*, and add others later. Or, buy all at once. If you plan to own several, consider an IBM computer



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can take information directly from BMS. Very, very handy. And ask about IBM Extended Support, a way to get software updates and telephone assistance, direct from IBM.

IBM

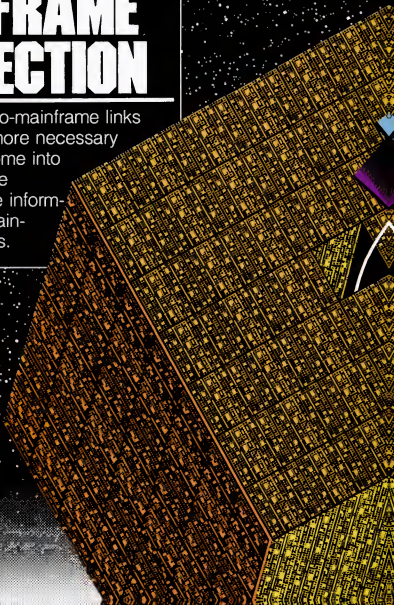
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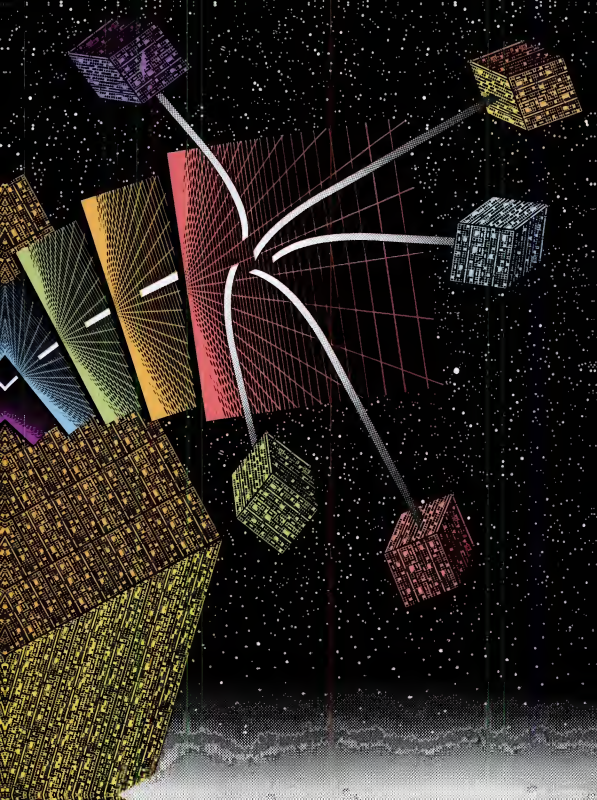
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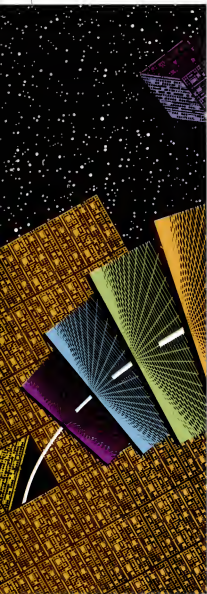
CAN WE TALK? THE MICRO TO MAINFRAME CONNECTION

Effective micro-to-mainframe links are becoming more necessary as more PCs come into use and as more people need the information in large mainframe databases.

Illustration: John Park







Major computer magazines and newspapers are full of articles lamenting the dearth of micro-to-mainframe communications, yet the advertisements they carry herald the answers to this problem. Somewhere in between lies the truth. The real problems have yet to be completely solved, but there are some good solutions to specific problems.

Before proceeding further, let's see what is meant by the terms *mainframe* and *link*. In general, a mainframe is a large computer that supports many users, though the introduction of the minicomputer has made the boundaries less clear-cut. Like the mainframe, the mini supports multiple users and has many of the same functions, but operates on a smaller scale. For our purposes, any computer that supports multiple users and stores databases of interest to a wide group of users will be considered a mainframe.

The term *link*, which refers to a connection between computers, is even more imprecise. At its simplest, a link is a means by which two computers exchange data. How many bits or bytes of data are sent at one time, whether they are sent over telephone lines or coaxial cables, and whether they are understood by the software or just blindly passed determines what type of link it is. The rest of this article will discuss what these differences are and how they may affect your particular application.

Computer links have traditionally been the purview of data communications analysts, but the advent of the PC has changed that. Computer links no longer occur just between mainframes but are now often made between PCs and mainframes. The reason most people who use PCs in their workplaces want such links is that many corporate mainframes have information

that these users need. Without a micro-to-mainframe link, a computer printout of this data must be typed into the PC—a time-consuming task that often introduces errors. Moreover, database services outside your company, such as Dow Jones, may also have data you need—and that you want to access through a PC. This article and the following ones should help you to have a better grasp of the subject.

Categories

Communications systems can be classified by both function and medium. The two major categories—simple and intelligent connections—are functional, whereas the subclasses within each category depend on the medium each system uses. Figure 1 illustrates these classifications and includes at least one representative product in each.

The medium through which you communicate with the host computer is in many cases beyond your control. IBM mainframes, their compatibles, and some minicomputers such as the Wang and the IBM System 36 talk to their terminals—and consequently to PCs—via one sort of coaxial cable or another. Both DEC's and most other minicomputers, plus many mainframes such as Univac's and Honeywell's, communicate by means of asynchronous RS-232 links, although most are equipped to use synchronous RS-232 connections as well.

Even within a given medium, many incompatibilities can arise. At the hardware level, 3270 coaxial cable is not the same as Ethernet coaxial; at the software or protocol level, SDLC and bisync are both synchronous but certainly not the same. Those of you who have tried simply to hook up a nonstandard printer to a PC know how confusing communications can get. Step a little deeper into this vast sea, and even the professional data communications analyst can drown.

Simple Connections

The distinguishing characteristic of simple connections—the first category—is that neither the host's system nor the terminal's knows the nature of the data it is transmitting. A stream of bits can be a floating-point number or a love letter—it's all the same to them. They relay the information faithfully and leave the interpretation to the user.

File Transfer

Simple connections permit the PC to transfer files and data to and from a host. The host computer need not run a special program; it believes it is talking to a normal terminal. Under simple connections, file transfer is of two types: unguarded and guarded. *Unguarded transfer*, which allows you to capture, or download, data sent by the host and to upload data from your file to the host, is accomplished without any special software on the host. However, since the host doesn't know it is

communicating with anything other than a terminal, it can't check that the data arrives uncorrupted. If you have ever used a terminal or PC over a phone line, you probably know what a great problem data corruption can be. *Guarded transfer*, on the other hand, means that a program running on the host talks to a similar program on the PC. The programs can be designed to ensure error checking, facilitate the movement of multiple files, and handle more advanced functions.

Virtual disks—another type of file transfer—allow the mainframe to emulate a disk on the PC. On the PC side, a device driver similar in concept to a RAMdisk traps all calls to a given disk, let's say G:, and asks the host computer via the connector to fulfill that request. A program running on the host computer understands the format of DOS disks and can service all the requests of the device driver on the PC. For example, suppose that a DIR G: command causes DOS to issue a call to the

device driver asking the G: disk to read all the sectors that contain directory blocks. The device driver receives the request and passes it on to the host computer. The program on the host then finds the requested sectors and returns them via some protocol that includes error detection and correction. The sectors are then returned from the device driver to DOS, which reads them and prints the directory listing. While this may seem complicated, it is actually an easy way to transfer files: All you do is use the G: disk; you don't have to learn any new commands. However, the G: disk may be slower than the other disks on the PC.

Asynchronous Links

Simple connections can be divided into three classes of products according to the different communications media they use. The first class uses asynchronous terminal emulation and file transfer. This program, which makes the PC simulate a terminal,

Connection versus Communications Medium			
	Asynchronous	3270 Coaxial	Synchronous
Simple	CROSSTALK XVI, XModem, Kermit, BLAST	IRMA IBM 3278/79 Emulation Adapter	AST BSC 3270 BSC Emulator AST SNA
Intelligent	Express Link, Framework	GOLDENGATE, FOCTALK	(None)

Figure 1: Micro-to-mainframe communication systems may be classified by their function or by the medium used. The functional categories of simple and intelligent connections form a matrix with the media, giving us a way of defining the bewildering variety of products.

Database manipulators bring us closer to the mythical micro-mainframe link that people are searching for.

communicates over RS-232 lines through an async port on the PC. It is often used to access a telephone network by modem. Products such as *CROSSTALK XVI* and *BLAST* fit into this category. Frank Derfler's "Date by Satellite" in this issue gives a good description of how *BLAST* works.

Asynchronous communication is also an area where much public-domain software has been written. The most popular of these programs are *Xmodem* or *Modem7*, and *Kermit*. (See "The Async Link" in this issue.) *Mobius* by FEL Industries is a good example of an asynchronous virtual-disk product. It not only creates a sophisticated virtual disk but offers other functions as well.

3270 Coaxial

The second class of simple connections uses 3270 coaxial terminal emulation and file transfer. While there are other types of coaxial communications (see "When the Mini Plays Host" in this issue), 3270 coaxial is by far the most prevalent. It is used with IBM and IBM-compatible mainframe computers that communicate via 3270 family terminals. These products are very similar in function to asynchronous RS-232 connections. The main difference is that this type of micro-to-mainframe communication requires additional hardware to create an interface to a coaxial cable—and this hardware is substantially more expensive than an async card, which is often thrown in with other features on a multifunction board. DCA's IRMA board is the best known of the hardware boards that emulate the 3270. Many other manufacturers—including Quadram, Persyst, and even IBM—are now producing these boards. John Singer's article on the 3270, "PC Metamorphosis: 3270 Emulation," offers some insights into this area and also takes a more in-depth look at virtual-disk products that use 3270 coaxial communications. Ed Valenzuela's "3270 PC: All

Things to All Users?" looks into another dimension of PC-to-mainframe 3270 communications.

Synchronous Links

The third class of products uses synchronous protocols. The two primary synchronous protocols, bisync and SNA/SDLC, both were developed by IBM for use on its mainframes. Since IBM compatibility is just as important with mainframes as it is with PCs, other manufacturers support these protocols as well. Bisync is most often used in the 2780/3780 communications protocol, which does not allow interactive terminal emulation but works in a batch environment. A tried-and-true protocol that is standard at many installations, it offers performance improvements over asynchronous communication in some cases. While special hardware may be required before your PC can use bisync, it is not as expensive as 3270 hardware. In "Bisync Comes of Age," Bill Harts describes bisync communications. SNA/SDLC also requires special hardware and has similar kinds of cost/performance trade-offs. Both bisync and SNA/SDLC are also able to support the 3270 protocol, which allows interactive terminal emulation but which is not readily available except on IBM mainframe installations.

Intelligent Connections

The second major category—intelligent connections—consists mostly of database manipulators. Since it is a relatively new area, not many products are available yet. However, database manipulators bring us closer to the mythical micro-mainframe link that people are searching for, and it is in this area that I believe most new PC-to-mainframe communications work will be done. Not coincidentally, current products in this category fall far short of their promise. Most of the existing database manipulators probably ought to

be called database extractors, since they lack the high-level knowledge of data that products in the future are expected to have.

Unlike the simple connection, the intelligent connection does know what data it is moving over the communications link. The general database manipulator provides some way to extract information from the mainframe's database and transmit it to a database, spreadsheet, or integrated application on the PC. The communications link for this category may be either async or 3270 coaxial, depending on the specific product.

Database manipulators can be classified not only by the medium they use—which may be either async or coaxial—but by their orientation as well. They can be thought of as tendrils that reach out from one computer to another over some communications link. The orientation of these tendrils—whether they are regarded as originating from the mainframe, from the PC terminal, or from the communications medium itself—is a useful distinction.

Most of the early database manipulators grew out of mainframe products. These include *GOLDENGATE*, an extension of the *IDMS* database from the mainframe, and *FOCTALK*, which comes from the mainframe database *Focus*. This does not mean that these products can be used only with their respective mainframe databases, but just that their orientation and emphasis is in that direction.

Some recent entries in this field from the PC side include *Framework* and *Symphony*. These types of packages grew out of PC-based products that needed to access mainframe data. Here a user is tied not so much to the mainframe database as to the PC software.

The other type of intelligent connection is more general: It is not keyed to any particular mainframe database or PC software but acts as a common intermediary

between the two. At present there are very few products in this class. The best example so far is *iLINK*. Since these and the mainframe-oriented products have received less attention than PC-oriented ones, Bill Harts will concentrate on them in his article, "The Future of the Connection," which will examine their promise and the reasons why, as of now, it remains unfulfilled. One product not mentioned here because it was reviewed in a previous issue is *GOLDENGATE*, designed to work with *Information Database*. Though it has flaws, *GOLDENGATE* shows what existing intelligent connections can do.

If this brief look at the types of micro-to-mainframe connections has stirred your curiosity, Charles Daney's article, "A Micro-to-Mainframe Primer," goes into more depth on what to look for when selecting the product that is right for you. The other articles in this issue should also give you a feeling for the micro-to-mainframe communications products that exist today and their capabilities.

One tantalizing question remains: What will the future of micro-to-mainframe communications bring? Most likely, the trend will continue along in the direction of intelligent connections. However, a product that will enable tomorrow's equivalent of 1-2-3 to connect to any machine and any database and manipulate the data transparently from your PC is still a long way off in the future. The major hurdle is standards. In an industry that seems at times to be the antithesis of standardization, a common data transmission and database access standard appears unlikely. At this juncture, few people are even aware that there is a need for such a standard. But until a standard emerges, you will have to make do with intelligent connections that are tied to particular hardware and software on both the PC and host computer. Or you may just continue to get by with simple connections that require more human intervention. ■

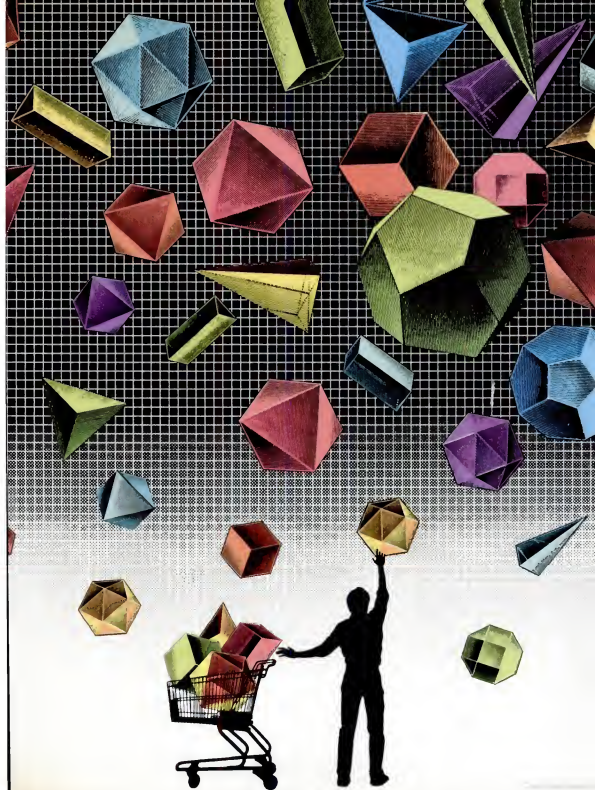


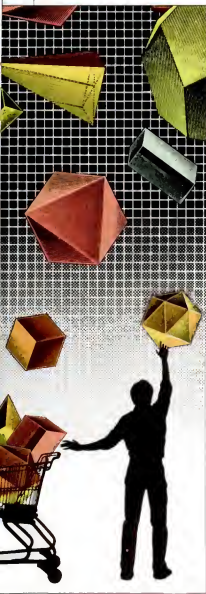


COVER STORY • CHARLES DANEY

A MICRO- MAINFRAME PRIMER

There's no escaping it: To make the connection, you need to become an expert. Prepare yourself to face the trials and tribulations with humor.





If you use a PC in business, think back to the day the PC arrived on your desk. You had probably anticipated its arrival for some time. You had already heard about the great productivity advantages a PC could confer, read about the PC, gone to some computer stores, and perhaps tried the software on someone else's PC. You decided that the right spreadsheet or graphics package could give you a real boost in doing your job.

Finally you felt confident enough to ask for that PC. To your great surprise, your boss agreed. Then the real fun began: figuring out exactly what hardware you needed to run that great spreadsheet and learning about RAM and ROM, fixed disks and floppies. Maybe you were tempted to choose a fancier spreadsheet program.

But at last the PC and the other hardware and software arrived. Then all you had to do was learn how to use it. Now you can run your spreadsheet with the élan of a champion driver in the Grand Prix. But you say you need a bit more data to complete your 5-year forecast of widget sales on the Iberian peninsula? No problem—you know that the data are safely ensconced in the multigigabyte memory of the corporate mainframe. All you have to do is connect up.

Congratulations! You may be about to undertake a journey as arduous as the one that led to your PC in the first place. I assume that your need for mainframe data is ongoing and not just an occasional requirement. What you want is a more or less permanent connection to one—or possibly more—of your company's mainframe computers.

Perhaps, if you are fortunate, your company has experts who can make that connection look as easy as plugging a lamp cord into an electrical outlet. If so, you don't need to read this article. Otherwise (so much for daydreams), you have

to become the expert, just as you did when you got your PC in the first place. Or maybe you have been appointed to become the expert. Either way, you are about to discover that computer data communication is not as easy as plugging *this* into *that*.

The long introduction is to prepare you for the trials and tribulations ahead with good humor. Do not despair; others have trodden the path before you. Some have drawn maps or written guidebooks—called standards. And although universal standards do not exist, in many areas of micro-mainframe communications good standards are already available.

One group chartered to develop standards (for many things, not just computers) is known as the International Organization for Standardization, or ISO. (The acronym is from the French form of the name.) Several years ago, ISO developed a standard conceptual model for discussing data communication, called the Open Systems Interconnection model (OSI).

Layers

It is important to recognize that the OSI model is not itself a standard for data communication (a communications *protocol*). The model simply supplies terminology for talking about communications. The model's primary concept is that the whole communications process can be analyzed as a few relatively independent component processes called *layers*. The layers are much like the familiar layers in any hierarchical organization.

Although the individuals in the top layer of an organization, for example, communicate directly with their counterparts in other organizations, the usual procedure is to hand their messages, in outline form, to subordinates who polish and refine the message, and then pass it down further through the hierarchy, until it reaches the mail room. The message, which is now properly packaged, labeled, and addressed, is then given to a delivery service

that carries it to the recipient organization. The message is passed up through the layers of the hierarchy until it reaches, finally (and perhaps as a summary), the intended destination.

In the OSI model, data communication is handled in exactly the same way. At the highest layer, an application program in one computer communicates with an application in another computer. Within the originating computer, the data to be transferred are passed down from one layer to the next layer, with each layer performing a prescribed task needed to prepare the data for physical transmission. Each step in this process is a necessary transformation of some type, because eventually the data may be transferred from one computer to the next in a quite different form—as signals on a phone line, pulses of light in an optical fiber, or radio waves. At the other end, the transformations have to be undone in the reverse order so that the final data are meaningful to the receiving application.

The OSI model identifies seven layers in the communications process. The highest layer is, in fact, called the application layer. For the moment, think of the other six layers collectively as a communication method by which the application's data are moved from here to there.

To make micro-mainframe communications serve your needs, you must carefully distinguish the application you wish to implement from the communication method that allows you to do so. This crucial distinction is easy to lose sight of, because many software packages today that should concern themselves only with the requirements of the application have a built-in dependency on one or perhaps two communication methods. However, it is better to consider the problem from the opposite conceptual extreme, in which the application program and the communication method are completely independent.

The distinction has a good deal of prac-

tical significance. You are probably starting from a position in which you know roughly which application you want to implement—whether it is as "simple" as extracting data from a mainframe database or as complex as creating an automated reporting system using hundreds of PCs in widely scattered locations. You are, I hope, in a good position to evaluate the application software that will be required. You are probably less certain about what communication methods are possible or preferable. The answer is, try to find application software that works with as large a variety of communication methods as possible. This is a good idea, too, because you probably have little control over the communication methods that your mainframe computer can use. Indeed, the communication methods can, and probably will, change.

Nevertheless, you need to know more about available communication methods so that you can be sure your application software is compatible with the methods your mainframe supports. You will probably need to buy hardware as well as software, and hardware is usually designed for

just one type of communication method, unlike the ideal software. Finally, if you are in the relatively advantageous position of being able to select among different communication methods, you will want to be able to decide which one fills your needs for the best price.

Communication Methods

The four types of communication methods that we are going to consider are asynchronous, binary synchronous, SNA/SDLC, and coaxial. (Bisync and SNA/SDLC can also be grouped under one category called synchronous. See the table in Bill Catchings's article preceding this one.) To sketch the distinctions among these four I will go into a little more detail about the OSI model.

The seven layers of the OSI model and their respective functions are shown in Figure 1. Notice that the order of the layers in Figure 1 is presented in the same way as you normally think of higher- and lower-level functions.

To use asynchronous communication, a PC must have an asynchronous communication adapter, also known as a serial

Layer	Function
7. Application	Provide end-user interface and services
6. Presentation	Implement common standard data formats
5. Session	Define and control a communications session
4. Transport	Provide transparent, reliable data transmission
3. Network	Control physical routing of data
2. Data Link	Handle the logical transfer of data bits
1. Physical	Establish physical or electrical connection

Figure 1: The layers of micro-mainframe processing from top to bottom.

port. Often one part of a multifunction card, it is usually quite inexpensive. The adapter is usually connected to another device, an asynchronous modem, with a cable designed for this purpose. The pins and connectors on this cable follow a standard known as RS-232, so this kind of communication is sometimes known simply as RS-232. Unfortunately, it is a misnomer, because RS-232 is purely a physical-layer standard, only a part of what is usually meant by asynchronous communication.

Actually, the method is called *asynchronous* because timing devices aren't used to keep the two ends of the communication synchronized. Instead, the func-

tion is accomplished by means of start bits and stop bits. One of the disadvantages of the method is that the start and stop bits waste a lot of time.

What makes any discussion of communications quickly become confusing is that there are usually many ways to do the same thing. In this case, you often find the asynchronous adapter and modem implemented together on a single card in the PC. Either way, the modem is then connected to the public telephone system. Physically, the connection can be a modular jack or an acoustic coupler, which uses a telephone handset. The logical connection is completed when a call is actually placed to the mainframe computer. The mainframe, in

SPEAKING THE LANGUAGE

For the uninitiated, the micro-to-mainframe connection can be as confusing as Babel. This glossary can help, however, by making you fluent in the terminology of communications.

1200 baud: The faster of the two common speeds used for data communication over dial-up telephone lines (the slower is 300 baud). Most mainframes and information-support systems with dial-up lines support this speed.

2780: Refers to the IBM 2780/3780 Remote Job Entry workstation, a data-entry station used to accumulate data and then send it to a remote mainframe for batch processing. You can get adapter cards or boxes and software that will let a PC act like a 2780/3780.

300 or 300 ASCII: A common standard transmission speed for fast mechanical terminals and for video terminals communicating over telephone lines. The standard ASCII format at 300 baud is as follows: 1 start bit, 7 data bits, 1 even parity bit, and 1 stop bit.

3270: IBM's designation for a series of terminals, printers, and data communication controllers used mostly on its large mainframes. These devices use IBM's SDLC or BSC communications protocols, instead of the simpler asynchronous methods generally used to regulate communication directly between PCs. With the help

of protocol-converter boxes or cards, a PC can emulate a 3270-series terminal or controller.

3274: IBM's designation for its cluster controller used to hook terminals to its mainframe computers. The 3274 can be hooked directly or via modems to the mainframe and terminals. Because the 3274 communicates with each terminal in its cluster by addressing individual units (called polled operation), up to several dozen terminals can be hooked up to the 3274 by the same coaxial cable.

3278: The IBM designation for one of its most popular terminals for mainframe computers. This terminal is part of the 3270 series and works with a controller to communicate to the mainframe via a complex protocol, such as IBM's BSC (most personal computers use the simpler and incompatible asynchronous protocol). The 3278 (Model 2) features a display showing 24 lines of text plus an extra status line. A PC can be used to emulate a 3278 terminal, but it must simulate the extra keys and lights by indirect methods.

3279: The IBM designation for a terminal in its 3270 series that is similar to the pop-

turn, has a similar modem and other equipment (a *communications controller*) to receive the connection.

This type of asynchronous communication is relatively slow, because the most commonly available asynchronous modems for PCs are capable of transmitting, at most, 1,200 bits per second (approximately equal to 1200 baud). Modems that can handle 2400 baud are starting to become available at reasonable prices, but interestingly, many mainframe communications controllers cannot handle that speed. Although 1200 baud roughly translates to 120 characters per second, faster than most people can read, it is often unsatisfactory for micro-mainframe com-

One disadvantage of async communication is that the start and stop bits waste a lot of time.

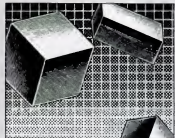
munications when large amounts of data must be sent.

The function of the modem is to convert digital signals to analog signals for the public phone lines and back to digital at the other end. However, if a PC is "close" to the mainframe (usually in the same building), you can dispense with the modems and connect the PC directly to the mainframe with an RS-232 cable, which is also known as a *null modem*. With this configuration, a PC can communicate as fast as 9600 baud. But the mainframe communications controller must also be capable of the same speed (and unfortunately most aren't). The PC software must also be capable of this speed, which is

ular 3278 but provides a color display. See 3270 and 3278 for more details.

3287: IBM's designation for its 3270 series printer. Using a protocol converter, a PC and its printer (or with some converters, only a printer intended for a PC) can substitute for this more expensive unit.

33: The Teletype Model 33, a typewriter-



style terminal with built-in tape punch and reader that was the main input and output device for the first generation of minicomputers. Its use of the ASCII code made this the standard for small computer use. Many mainframe software packages are still set up to assume Model 33 operation as the default for remote terminals, although the

actual device is more likely to be a video display that emulates a Model 33.

3705: Short for the IBM 3705 Communications Computer. This specialized computer handles data communication for 370-series computers. Along with communicating to 3270-series devices, it can be configured to provide a limited number of ports for dial-up access using the simpler asynchronous methods generally used by PCs.

9600 baud: The fastest common transmission speed available on many terminals and other peripheral devices and over ordinary telephone lines. This is the speed that most external protocol converter boxes use to send data back and forth to a PC.

access method: A program or section of the operating system that defines how data is read, written, and updated. Programs for large computer systems are often characterized by the access method they are designed to be used with.

async (asynchronous communication): a method of transferring data that does not require the information to be sent at a constant pace. It is the standard method of communicating on most personal comput-

er links on which people must read or send some of the information, including public communications networks, bulletin boards, and information utilities such as The Source or CompuServe. Many mainframes and most minis support async communication for dial-up connections using modems, and some also support this mode for directly connected terminals. Asynchronous communication is easy to implement but is less efficient than synchronous methods.

baud: A measure of data transmission speed, equal to the number of signal changes per second. Between terminals, PCs, modems, and printers, where data is sent as binary pulse, the baud rate and bit rate is the same. However, on the actual connection between modems, more than one data bit is often sent in each signal change, producing a lower baud rate than bit rate.

BCP: An abbreviation for byte control protocols, another name for character-controlled protocols (a protocol is a way of regulating how information is sent and received across a communications link). Byte control protocols, of which IBM's

unlikely unless it is written in assembly language.

The conclusion is that you can easily implement asynchronous communication if you stick to speeds of 1200 baud or less. Higher speeds are possible (and desirable), but require much more careful selection of equipment and verification that the mainframe is also prepared to handle the chosen configuration.

Bisync

The second kind of communication is known as binary synchronous communication, bisync for short. Strictly speaking, bisync is just another physical- and data-link-layer protocol (see Figure 1). IBM

developed bisync in the 1960s partly because async modems, which relied on stop bits for synchronization, were limited to speeds of 300 baud at that time. By supplying internal timing devices in the modems, synchronization between the two ends of the communication could be maintained at much higher speeds. Speed is a physical-layer consideration, but bisync also supplied some functions of the data-link layer by defining a variety of special control characters, which async communication lacks.

One such character, called SYN, enabled the modems to establish synchronization initially. Other characters, such as ACK and NAK (acknowledge and nega-

SPEAKING THE LANGUAGE

bisync is the most well known, send messages as headers followed by an information field and require both sender and receiver to maintain various counts and decode control characters. See character-controlled codes and bisynchronous communication for more details.

bisync (binary synchronous communication): An IBM protocol for sending data over communications lines. It is one of the most common methods by which large IBM computers in the 370 and 40XX series, as well as many small computers made by IBM and others, communicate with remote terminals and computers. Whereas newer IBM designs use SDLC (synchronous data link control), there are a vast number of bisync terminals in use, and most new equipment and data communication circuits support bisync as one option among others.

Bisync is a byte-controlled protocol,

sending data in frames marked by synchronization characters. After two synchronization characters, each frame has a start of header character, a header containing control and address information, a start of text character, the actual text, an end of text character, and a cyclic redundancy check character serving as a checksum.

Data is normally coded in the IBM code called EBCDIC, but there is provision for using other codes such as ASCII by declaring the message transparent, meaning that control codes are to be ignored there.

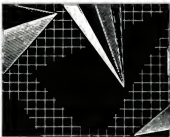
The bisync protocol supports both point-to-point and multipoint operation—point-to-point has only two devices, such as a computer and one terminal, on a line; multipoint has a single controller, such as a computer, which can talk to many terminals, each of which must have an individual logical address and the local processing ability needed to recognize that address in message headings.

break: A signal that says that the normal flow of data should be interrupted. Many mainframes that support asynchronous communication (the normal serial communication used by the PC) listen for the

break signal to interrupt long transmissions. The PC's hardware can generate the break signal if directed by the appropriate software.

BSC: An abbreviation for binary synchronous communication, the method of regulating data communication used by most large IBM computers in the 1960s and 1970s.

character mapping: A list of the substi-



tution method used when translating character codes used on one machine to those used on another, such as going from the ASCII code used by PCs to the EBCDIC code used by IBM mainframes. A direct one-to-one mapping can't be done in most

tive-acknowledge), were used to signal that a message had (or hadn't) been correctly received. The computer determines that a message is correct by using *checksums*, numbers computed as a function of the actual data. The simplest example of a checksum is the addition of all the characters as if they were numbers. The message itself is bracketed by two other special characters, STX and ETX (start text, end text).

Bisync thus has several advantages over async communication. It can support higher transmission speeds over telephone lines—4800 or even 9600 baud. It can detect transmission errors much more effectively by the use of checksums,

You can easily implement asynchronous communication if you stick to speeds of 1200 baud or less.

whereas async includes only a parity bit for error detection. And bisync provides for error correction by retransmitting data found to be incorrect. (Although an asynchronous communication method has the potential to do the same things, such error checking is not standard equipment, as it is in bisync.)

But the deciding factor for using bisync rather than async in a PC-mainframe application may well be that many mainframes (IBM's in particular) support bisync much better than async. Most IBM mainframes are set up to handle either bisync or SNA/SDLC, which I will discuss later. You will probably choose to use whatever your mainframe supports.

cases because each character set may have characters not present in the other. For example, ASCII has no direct equivalent of the cent sign used in EBCDIC.

cluster: A group of terminals or other input and output devices that share a common communications path from a computerized system. Clusters are often managed by a local cluster controller, which directs the flow of information between the computer and the units in the cluster.

coaxial cable: A type of communications cable used for networks and for connecting terminals to mainframe computers. When PCs hook up to mainframes through protocol converters, the converter hooks up to the controller with coaxial cable. Coaxial is more expensive than the telephone-style cable often used for hooking up personal computers, but can carry data at higher rates and is more resistant to electrical interference. A coaxial cable is round, with a center conductor surrounded by an outer braid or foil.

couple: To join cables, especially ones with connectors (joining those without connectors is referred to as splicing).

data bits: As applied to data communica-

tion, it is the number of bits used for sending each character, not including the added checking and timing bits. Most mainframes expect 7 data bits when talking with ASCII terminals, but some can also be set to 8.

dial up: A port on a mainframe accessible by the switched telephone network. Some mainframes have dial-up ports set for ASCII terminals or for PCs, but many data processing managers feel they create an excessive security problem. For computers that only support complex protocols such as BSC or SDLC, some protocol converters can be set up to answer a telephone line.

download: To send a file from a larger or remote computer to a smaller or local one. Downloading requires some way to synchronize the sending of the file by one system with the receiving and storing away of the data by the other. Although text files often can be sent with very simple software, exchanging programs and numeric data requires more sophisticated error-checking methods.

EBCDIC: An acronym (pronounced ip-sa-dik) for extended binary-coded decimal

interchange code. This is the code that IBM uses for representing characters and control values on its large computers. The EBCDIC code uses the 256 possible 8-bit patterns to represent a selection of graphic (printing) and nongraphic (control) codes. It is an extension of the code used on the standard punch card. Although the code values are different, both ASCII and EBCDIC have mostly the same graphic characters, so it is relatively easy to translate from one to the other for simple text. However, many of the control codes are quite different.

extract: To pull out selected parts of a mainframe database to be downloaded to a PC.

front-end processor: A computer used to enter, check, or compress data before it is sent to a mainframe for further processing. A PC can be used for a front-end processor, but special software may be necessary to transfer the results to the mainframe.

gateway: A connection between two dissimilar networks. One way of connecting PCs to mainframes is through a local area network (LAN) of PCs hooked up through a gateway to a mainframe network.

The confusion between communication method and application is common in discussing bisync. Historically, bisync has been used for two somewhat different applications: interactive terminals and noninteractive remote job entry (RJE) workstations. The IBM 3270 family provides the best-known example of interactive bisync terminals. IBM products known as 2780 or 3780 RJE stations are the primary examples of the noninteractive application. Their function is the submission of batch jobs on punched cards and printing of batch output.

The confusion is encouraged because most products advertised as bisync connections are specifically of the 3270 or

2780/3780 type. That is, they include application layer functions as well as strictly communication functions. In fact, however, 3270 and RJE workstation products may use the third communication method, SNA/SDLC, as well as they do bisync. Yet the distinction is crucial, because if you don't get the right method—bisync or SNA—the product may very well be unable to communicate with your mainframe.

To use one of the bisync products you usually need a bisync adapter card that plugs into your PC and a bisync modem. The bisync card and modem are completely different from async adapters and modems, and significantly more expensive.

SPEAKING THE LANGUAGE

host: The computer that contains the software that is the primary regulator of a data exchange. In most cases, when a PC is linked to a mainframe, the mainframe acts as the host. The host echoes characters sent in by the PC, allowing a PC operating in full duplex mode to show on the screen characters typed at the keyboard.

hot key: A key that lets you switch between using the PC as a local terminal of a large computer and using it as a computer when a PC is connected to a large mainframe computer. Some, but not all, packages provide this capability, usually as a software command sequence.

integral controller: A communications unit built into a mini or mainframe (in contrast to a front-end processor or cluster controller used to talk with terminals).

local: A connection between a large computer and its terminals and controllers by wire rather than via a communications link

and modem. This mode is also called channel-attached.

multiplexor (or **multiplexer**): A device that combines several communications channels so they can be more efficiently sent over a data link or connected to a mainframe. Most multiplexors are designed for transparent-mode operation, which means a PC hooked to the multiplexor operates just as if it were hooked directly to the mainframe.

protocol: A set of rules for how information is exchanged over a computer network. Personal computer data networks generally use very simple protocols meant originally for teletypewriters, a public-domain protocol called *Xmodem*, or various protocols included in proprietary software packages. Large computers use more complex protocols; the best known are IBM's BSC and SDLC (see each for details). Although directly incompatible, personal computers can be hooked up to large computers with protocol-converter units.

protocol converter: A box or card that connects a PC and a mainframe computer that would normally expect to communi-

cate with an IBM 3270-series terminal. With an external protocol converter, the PC runs software that makes it emulate a terminal, and the protocol converter translates between the emulated terminal and the special requirements of the 3270 series. Internal converters, on the other hand, translate as well as match the asynchronous protocol used by the PC for serial communication or the internal operation of the PC screen to the BSC or SDLC protocol used by the 3270; the converter also translates positioning commands for the mainframe terminal to the form understood by the Apple communications program. Other operations include translating sequences of keys from the EBCDIC code used by the mainframe and the ASCII code used by the PC, buffering between the polled page-at-a-time method used by the mainframe and the asynchronous character-by-character method used by the PC, converting the cursor-positioning commands for the mainframe host terminal to the form understood by the PC screen or terminal emulator, and translating sequences of keys from the PC keyboard to the signals ordinarily made by the keys on

The bisync modem, besides converting signals between analog and digital, must have timing circuits and watch for the SYN character. The adapter has to handle the other special bisync characters and compute checksums. Furthermore, although bisync can be used on dial-up (public) phone lines, to use the higher transmission speeds you usually need a private leased phone line that has been specially conditioned for higher quality.

When you are using a 3270 bisync emulation product, your PC is actually emulating both a 3278 or 3279 terminal and a 3274 cluster controller. The 3274 is a special type of device, which we shall encounter repeatedly, called a *control*

Confusion between communication method and application is particularly common in discussing bisync.

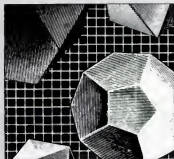
unit. Its function is to multiplex the data for several terminals onto a single transmission line and to supply some of the actual terminal control. Thus a real 3274 connects several terminals to a bisync modem. Some bisync 3270 products, such as the AST-BSC card, emulate this behavior. The AST-BSC even lets you connect asynchronous terminals like the IBM 3101 or DEC VT-100, and simulate them as 3270s. And the mainframe at the other end thinks it is communicating with a bisync 3274 control unit.

SNA/SDLC

Not long after IBM introduced bisync in the 1960s, it became evident that much

the mainframe's normal terminal.

protocol transfer: A transfer of data that uses an error-checking method to ensure that the data is correctly received. Usually, the system does not show the data during transfer but displays information on the status of the transfer instead. Because pro-



tol transfers require both ends of the conversation to use matching programs, special software must be installed on the mainframe end as well as the PC to use this kind of transfer.

query: A request for information from a user or user program to a database. Main-

frame software intended to work with PCs often allows for queries from the smaller system to be formulated in natural, non-technical language. The mainframe then translates this to the formal request needed by the mainframe database, secures the requested information, and then formats it into a form that can be sent to the PC.

remote: A controller that connects to its host mainframe via a modem or other data link (as opposed to a local controller, which is wired directly to the mainframe).

RJE: The common abbreviation for remote job entry, the entering of data through a remote terminal onto a mainframe for batch processing. RJE was very popular in the seventies but is slowly being replaced by distributed processing or personal computers.

script: A prepared set of input lines that can be sent automatically by a communications software package to provide the log-on and password inputs needed to connect to many mainframe systems. More sophisticated packages offer programmable (or interactive) capabilities, which respond to the messages from the main-

frame rather than just blindly sending a fixed set of inputs.

SDLC: An abbreviation for synchronous data link control, a communications protocol used by large IBM computers, especially in networks based on its SNA (systems network architecture) arrangement. PCs can link up to these networks through internal protocol converter cards or with external converters that expect a terminal emulator on the PC side and speak the mainframe's SDLC protocol on the mainframe side.

session: A complete set of interchanges between a user and a remote computer, starting with a logon and ending with a log-off. Many large computers treat a session as one of their basic units of communication. On multiwindow systems such as the 3270 PC, one session can be shown in each of several active windows.

SNA: An abbreviation for systems network architecture, an IBM system of data communication for large computers. A protocol converter card or external protocol converter follows the SNA scheme, communicating using the SDLC protocol (or the older BSC protocol for some mod-

more could be required of a protocol, both in performance and function. Therefore, in 1973 the much more comprehensive System Network Architecture (SNA) was announced. SNA was really an early attempt to supply a conceptual model for computer and peripheral networking such as the one eventually incorporated in the OSI model. SNA is much like the OSI model in spirit, although the details are rather different and exact correspondences are hard to identify. But at the lowest level, SNA used a data link protocol known as SDLC (Synchronous Data Link Control).

Of course, SDLC is a synchronous method like bisync, but it differs in many

specifics. In particular, SDLC uses a technique called *bit-stuffing* to frame messages instead of the *byte-stuffing* that bisync uses. But most importantly, SDLC is totally incompatible with bisync. Although some IBM mainframes have been set up to handle both SDLC and bisync, the setup requires completely separate and parallel software, hardware, and communication lines. In connecting to a mainframe, you must know precisely which of the two alternatives the mainframe supports.

To use SDLC, a PC must have an SDLC adapter card, connected to an SDLC modem. Naturally, these are different from the async or bisync analogs. But in general, the situation is similar. Again,

SPEAKING THE LANGUAGE

els). SNA is a complex, layered set of rules that regulates error checking, addressing, synchronization, and many other communication chores.

start bits: A timing bit used to indicate the start of a new character during asynchronous data transmission (where no signal is sent to keep timing if there is a gap between characters). To communicate with a mainframe using async, a PC must be set to the same number of start bits as the mainframe.

stop bits: In asynchronous communication, an extra bit added after each character to tell the receiving system that the character has ended and that any following bits are to be considered part of the next character. To communicate freely with a mainframe, a PC must be set up to use the exact same number of stop bits as the mainframe. The most common number of stop bits is 1, with 2 sometimes used for trans-

mission speeds below 600 baud (about 60 characters per second).

terminal emulation: The imitation by a PC of an ordinary terminal for the purpose of communicating with a remote computer or communications network. Many large computers only expect to communicate with certain standard terminals, and it is usually easier to have the PC imitate the needed terminal than to try and change the large computer.

transparent mode: For a PC acting as a terminal connected to a mainframe, a mode of operation in which all characters are displayed exactly as received. Control characters, instead of triggering operations such as clearing the screen, are shown as special graphics or as character pairs. This mode is most often used for testing and debugging or when the control characters being sent are meant for another terminal and cause unwanted actions.

upload: To send a file from a smaller computer or local one to a larger or remote computer. Uploading depends on both the computer at the sending end knowing what to send and how to format it and the system at the receiving end knowing to listen and

to store the data. Most communications programs for the PC are set up only to upload data to bulletin boards or other personal computers, but an increasing number are adding special routines for dealing with mainframes that expect terminals or remote-job-entry terminals. Although some mainframe programs can now accept text files from PCs, sending programs or numeric data is best done with some kind of more structured protocol.

VT100: A trademark of Digital Equipment Corporation for one of its terminals. This model is one of the most popular for async connections, and consequently it is the terminal that most communications packages for the PC simulate to allow the PC to be connected to larger computers and communications networks. Most external protocol converters for the PC that expect the PC to run terminal emulation software assume VT100 emulation at the PC end.—Steve Rosenthal

Portions of this material are based on Steve Rosenthal's Personal Computer Glossary to be published by Prentice-Hall.

most SDLC products are designed to work with one or more specific applications—specifically 3270 or RJE workstation emulation. And again, the resulting configuration is connected via a leased phone line to a mainframe. If the PC is emulating a terminal, the PC will appear to the host to be a 3274 cluster controller.

Coaxial Connection

The fourth, and last, type of communication method is what I've called a coaxial connection, because you use coaxial cable instead of an RS-232 cable. So far, this method has been used only in the 3270 terminal emulation application. For a coaxial connection, you need only an adapter card whose plug accepts the standard IBM 3270 coaxial cable. The other end of the cable is attached to a real (not emulated) 3274 control unit. The same 3274 can have several PCs attached this way, as well as several real 3278 and 3279 terminals. In turn, you can attach the 3274 to the mainframe in several different ways. Two are already familiar: bisync and SDLC modems connected to a phone line. In the third type of attachment, possible only if the 3274 is physically close to the mainframe, you connect the 3274 directly to the host (through an interface called a *channel*). Though the bisync and SDLC connections are still limited to a speed of 9600 baud, the channel connection can be much faster—by a factor of 10 or 100.

At first glance, it appears that you get less with a coaxial adapter product, because all you get in your PC is a simulated 3270 terminal, and the 3274 control unit is extra. With a bisync or SDLC adapter the 3274 emulation is part of the product. But you may be getting more because coaxial adapter products are capable of much higher speeds (which is why coaxial adapter products appeared later than bisync and SDLC adapters). The higher speed is important for terminal response time, more so if large amounts of

data have to be transferred. But remember, the higher speed is possible only if the PC is directly connected (not over phone lines) to the 3274, which, in turn, is directly connected to the mainframe.

Micro-Mainframe Applications

Having seen the four main types of micro-mainframe communication methods, let's turn to the applications that will use these tools. Besides the 3270 terminal

Look for stylistic similarity between the facilities of the communications program and those of the host mainframe.

and RJE workstation emulation, many other generic applications exist.

Let's look at the following types of applications:

- terminal emulation
- file transfer
- RJE workstations
- virtual disk systems
- cooperative processing

In principle, you should be able to implement any of these applications using any of the communication methods described. Of course, performance or cost considerations could rule out some methods. But the major determining factor usually will be that most of today's main-

frames are set up to support only one or two of the methods very well.

Terminal Emulation

Terminal emulation includes async terminals as well as IBM 3270s. Most non-IBM mainframes may support manufacturer-specific terminals, but they almost always support generic async terminals as well. IBM mainframes, on the other hand, are strongly biased to 3270-like terminals, and support other kinds poorly, if at all.

The simplest kind of asynchronous terminal emulation does little more than read and write characters across the RS-232 interface, which is called TTY emulation, after the venerable Teletype. Such emulators also respond to a few special control characters (carriage return, line-feed, bell). PC software for this type of emulation is usually given away and is worth about that little.

The more interesting type of asynchronous terminal emulation on a PC is one that emulates a specific model of terminal, such as the DEC VT-100 or the IBM 3101. Such terminals are actually very sophisticated and have several useful capabilities, such as limited local editing of data, highlighting, protected fields, and so forth.

If you are inclined to async communication, I recommend an emulator package that includes either VT-100 or 3101 emulation. Many mainframes can take advantage of the special features of these terminals. And when you use these packages with IBM mainframes, you can do a second level of emulation that gives you nearly all the 3270 functions as well.

What's that—an emulator on top of an emulator? Yes, and it can be important if you have to talk with IBM mainframes over an async connection. The concept is called protocol conversion, a good example of how you can use almost any application over almost any type of connection—in this case, 3270 terminal emulation with async terminals. (continued)

Procedures can be written on the mainframe to control the PC.

Many protocol conversion products are available in a bewildering variety of forms. Some consist of software running on the mainframe (from Simware or VM Personal Computing). Some are software that runs in the mainframe's communication front-end (an IBM Series/1). Some are implemented as software that runs in public packet-switched networks like Tymnet. And some are boxes that connect between your serial port and a synchronous modem (from Protocol Computers, Inc., or IRMALINE from DCA). The common denominator is that these products make specific types of asynchronous terminals appear to the mainframe as 3270s. Most significantly, they support a PC that emulates the right kind of terminal as well.

But even an async terminal program that emulates a VT-100 or a 3101 may be unsatisfactory for a mainframe connection. Other features are more important in this environment than they might be for connecting to bulletin boards or to other micros.

File Transfer

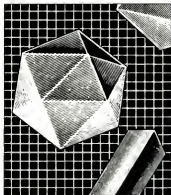
File transfer capability is probably the most important such feature—so important that I will deal with it separately later. Here are some other things to look for. First, the program should have a sophisticated *macro* or *script* capability that allows sequences of commands to be collected together. These scripts should also be capable of examining incoming data so they can decide about the processing to be done. This feature can be used to build applications that are not only very powerful, but also easier to use than most mainframe procedures. Similarly, the program should be able to redefine the meanings of keys and even to assign strings to be sent by specific keys.

A subtler feature to look for is stylistic similarity between the facilities of the communications program and those of the

host mainframe. For example, if the program has a built-in editor, it should be as similar as possible to the mainframe editor for clarity.

Another often overlooked feature but one that can be extremely important is the mainframe's ability to send commands to the PC. These commands can be either related specifically to the communications program or they can be general DOS commands. With this feature, procedures can be written on the mainframe to control the PC so that you have a complete application well-suited to your needs. For example, such an application might put up a few menus to get directions from users, do some computations using mainframe data, download the resulting data in graphic form, and then use a PC program to display or print the graphics—just a simple example of *cooperative processing*.

So far I have dealt only with asynchro-



nous communication programs, almost always purchased separately from the communication adapter. In contrast, for the other communication methods the software is usually bundled with the adapter in a single product. The hardware takes care of the lower-level protocol details (layers 1 to 4 of the OSI model in Figure 1) while the software handles the higher layers, but

the details vary widely from product to product.

Beyond selecting a product whose communication method your host mainframe supports (and total cost), a few other features are worth looking for. The first is file-transfer capability. You should be sure the product you are considering can transfer files and that it meets certain criteria I will discuss.

Just as the 3270 family of terminals has members with a wide diversity of features, so too will products that emulate members of the family. The 3279 terminal, for example, supports color—either four or seven colors. You should be sure the emulation product supports color, too, if that's important to you. Some 3270 models also have graphics capability that you may wish to emulate. Printers are also a common feature with 3270s; be sure the PC printer can be used to emulate a 3287 if you need it.

Since the hardware products that use bisync or SDLC connections also incorporate emulation of the 3274 or 3276 control unit, you may be able to connect other PCs via serial ports, thereby allowing a whole cluster of PCs to emulate the 3270. In effect, the adapter is also a general async-3270 protocol converter, which can greatly reduce your costs.

The IBM 3270 PC itself is a bit like a PC with a coaxial adapter board, but not quite. Much popular PC hardware and software is, in fact, incompatible with the 3270 PC. On the other hand, the 3270 PC has several dramatic features, such as the ability to handle four concurrent mainframe sessions in different windows, two scratchpads, and a PC-DOS window too. A somewhat similar product (though not an actual 3270 PC emulation) is the CXI 3278/79 PLUS PC adapter board from CXI, Inc.

One last comment: If you have never used a 3270 terminal before, you will discover that its keyboard is quite different

from the PC's. Although 3270 keyboards vary from model to model, they all have keys the PC doesn't, making 3270 emulation of any kind on a PC rather awkward. (The missing keys have to be assigned to "spare" PC keys.) DCA, which makes the IRMA adapter, now offers a keyboard for the PC that has all the "missing" keys in addition to all the regular PC keys.

Catching Errors

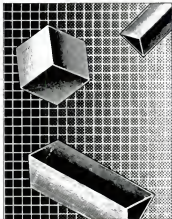
Still, the single most important feature of a terminal emulator is probably the support of some sort of error-correcting protocol for file-transfer. This is so important that I single it out as a separate application, although most file-transfer products are included in or built around a terminal emulator.

If you think about it for a minute, terminal emulation is nearly a requirement of any micro-mainframe communications product. The reason is that all mainframes know how to communicate with terminals, but very few can communicate with anything more intelligent than a terminal—like a PC. Therefore, terminal-emulation capability is the foundation of most other communications applications. In particular, a "session" is usually established by logging on in terminal mode. Further interaction then proceeds by packaging data as if they were terminal traffic (an example of a transport layer in the OSI model). Some of the more sophisticated products that do cooperative processing may hide the terminal emulation to make things easier for you (one key starts the whole process). But it's still there under the covers.

You need a special protocol for file transfer for several reasons: the communications process inherently introduces errors into data; either end of the communication may be forced to accept data faster than it can handle it; file structures and formats differ on mainframes and micros; and even the character codes can differ between

mainframes and micros (IBM mainframes use EBCDIC instead of ASCII). Solving these problems is the purpose of the file-transfer protocol.

The *Xmodem* protocol, invented by Ward Christensen, is the best-known of the file transfer protocols for micros.



Unfortunately, it assumes that all 256 possible 8-bit bytes can be passed without alteration between the two ends of the communication. Surprisingly, this is rarely possible with a mainframe. Because mainframe communications techniques were designed when the TTY was the standard, the techniques made many assumptions about what was and wasn't legitimate data. These assumptions don't make it impossible to do fully transparent and error-controlled file transfers, just more difficult.

Another increasingly common file-transfer protocol that is not proprietary is called *Kermit*. Developed at Columbia University by Bill Catchings and others, it can be used any time both computers that need to transfer files have a version of the *Kermit* software. In particular, *Kermit* is available for IBM and DEC mainframes, as well as the PC. In fact, several com-

The best communications programs usually have their own proprietary file transfer protocols.

mercial PC terminal emulators now have support for the *Kermit* protocol. If you have *Kermit* software on your mainframe, you might consider testing one of these emulators to determine whether *Kermit* meets your needs. But note that *Kermit* works only with an asynchronous connection.

The best communications programs now usually have their own proprietary file-transfer protocols, which offer the advantages of speed and function over the public-domain protocols. However, they require corresponding software to be available for the other end of the connection. Unfortunately, only a few packages have implemented their protocols on IBM mainframes. Notable examples are *Relay* from VM Personal Computing and *SIMPC* from Simware. These two products also support good 3270 emulation over asynchronous lines.

Be sure that the file-transfer mechanism allows for transfer of both text (printable characters) and pure binary data. Text data usually has to be converted from ASCII to EBCDIC or vice versa, whereas binary data should not be converted at all. Graphic data, which may consist mostly of x-y coordinate pairs, are examples of binary data.

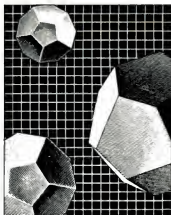
Another consideration that is easily overlooked is how the file-transfer protocol deals with different file formats. PC-DOS files often, but not always, use the convention that a carriage return-linefeed pair marks the end of a line. Mainframe files usually do not contain such delimiters; they keep track of line boundaries by other means. The result is that you need options that indicate how such problems are to be handled.

Finally, speed is important in transferring files that might be several megabytes in size. It takes nearly 2½ hours to transmit a megabyte of data at 1200 baud. Therefore, any techniques for more efficient transfer are valuable. One technique is

data compression by eliminating redundant information (the data is decompressed automatically at the other end). A different technique minimizes possible delay in line turnaround by transmitting several blocks of data before expecting an acknowledgement. Another big advantage is the ability to do the file transfer in background, leaving both the PC and the mainframe free to do other work.

RJE Workstations

Although in the distant past, RJE workstations, like the IBM 2780, 3770, and 3780, were used for submitting batch jobs to a computer by reading funny pieces of cardboard called punched cards, their primary interest for today's PC user is as a special means of doing file transfer. They transfer files by sending files to the main-



frames as virtual card decks and receive files as virtual printer files. Yes, they can also print the files if you want.

Files are transferred in this peculiar fashion mainly because most mainframes already have software for using RJE workstations, whereas they often cannot deal with strange devices called PCs. As noted before, RJE stations usually operate on a

bisync or SNA/SDLC connection instead of an async connection. Therefore, error and flow control are standard parts of the protocol. The higher 4800- or 9600-baud speeds are also standard, but you may need specially conditioned phone lines.

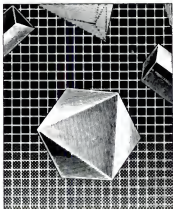
In selecting an RJE workstation product, be sure you get one that uses a protocol supported by the mainframe: bisync or SDLC. You also need to get the appropriate kind of modem, which can be expensive (\$2,000 to \$3,000). On the other hand, many bisync and SNA adapter cards designed for 3270 emulation also have an option for supporting RJE protocols (for example, the AST-BSC and AST-SNA products).

Several products on the market allow files to be stored on the mainframe but accessed by the PC as if they were on a local floppy or fixed disk. The result is called a *virtual disk*. If this sounds familiar, this is how most local area networks share a hard disk among a number of PCs. In effect, the mainframe has stepped into the role of a file server.

You can use this technique for file transfer; in this case, it is much simpler for you—the DOS COPY command does all the work. The technique has several advantages over file transfer, however, besides transparency of operation. For example, you may need only a few records from a large file such as a database, and accessing those records on a virtual disk is much faster than transferring the whole file. Also, the files on the mainframe can usually be accessed by many PCs simultaneously, thus letting their users share data just as if they were on a local network (which, in effect, they are). Just be sure the package has file-locking abilities to prevent two users from trying to update the same file simultaneously!

You should consider other factors in a virtual disk package, besides file locking. What mainframe operating systems are supported (VM/CMS, MVS, or DOS/

VSE in the case of IBM mainframes)? What communication methods can be used (async, bisync, SNA, coaxial)? Be especially careful with other than async connections—the product may depend on which particular adapter is used (IRMA, CXI, Forte, and so on). Finally, are virtual disks on the mainframe stored in a differ-



ent format from normal mainframe files? If so, is there a utility for moving mainframe files in and out of virtual disks?

The *Tempus-Link* package from Micro Tempus, Inc., is perhaps the most notable current example of a virtual disk package. The package, in fact, supports most IBM mainframe operating systems and most communication methods. Another very different example is provided by the IBM XT/370 personal computer. This product is unique in that it runs the same operating system (VM/CMS) on the PC as on the mainframe. VM/CMS disks can reside either on the PC or as virtual disks on the host. But it can use only its own 3270 emulation adapter for communications (a coaxial connection).

We use the term *cooperative processing* here to cover everything else available for micro-mainframe communications. Although it is a catchall category, it covers

the most sophisticated and powerful products. However, because of the diversity of these products, it is hard to generalize about their functions or the criteria to be used in their selection.

Cooperative processing may become an industry buzzword in 1985 to rival the phrases *user friendly* and *expert system*. IBM, for example, has begun to use it regularly in pitches to large accounts—how good it will be when customers finally get their mainframes and thousands of PCs to work together in perfect harmony. I use the term here simply to denote the highest level of micro-mainframe application integration.

In a few years, cooperative processing will be viewed as the normal mode of using PCs and mainframes together to solve problems. But at the present time, few products really do cooperative processing. Instead, cooperative processing applications today are usually constructed laboriously out of available component parts. You can build your own cooperative processing application to suit your needs by using the capabilities of some of the more sophisticated file-transfer or virtual disk packages.

The truth is that off-the-shelf cooperative processing packages that are now available are largely experimental—with you as the guinea pig. This doesn't mean they don't work. Far from it. When the package does just what you want it to do, it can be quite satisfactory. The problem is finding one that does what you want. Unfortunately, the cost of shopping around is also quite high. The mainframe part of the package may cost upward of \$50,000, and the PC part \$1,000 per PC, or more. Worse still, the package may depend on other mainframe database packages, which can cost \$100,000 or \$200,000. A decision on one of these products is not for the faint of heart. Today the price of power and ease of use is very high.

(continued)

Soon we'll see a flood of software than will make mainframes and PCs more cooperative than ever.

Database Extractor

Even at this early stage, the outlines of a few generic types of cooperative processing products are emerging. The first type is the *database extractor*, which interfaces between PCs and existing mainframe database systems. On the mainframe, such products can usually interface to one or more commercial database packages (IBM's *IMS* and Cullinet's *IDMS* are two of many). These products also use mainframe software called *data dictionaries* that keep track of the available data, their location, and storage format.

On the PC side, these packages use systems of panels and menus to allow you to search for the data you need and then to issue instructions that result in the data being extracted and downloaded to the PC. Once the data is on the PC, these packages can massage the data into the proper format for entry in a spreadsheet program of your choice.

One of the most complete packages of this type is *Information Database/GOLDENGATE*, from Cullinet Software, Inc. (see PC, Volume 3 Number 22). *Information Database* is the mainframe part, while *GOLDENGATE* is a PC-integrated software package consisting of the usual five components (spreadsheet, database, graphics, word processing, and communications). Not surprisingly, *Information Database* is strongly oriented toward the use of Cullinet's *IDMS* database system. In contrast, the Answer series of products from Informatics General Corporation has been carefully designed to work with a wide range of mainframe database products (including *IMS*, *IDMS*, Cincom's *Total*, and Software AG's *ADABAS*). On the PC side, this package initially interfaces to the VisiCorp products.

A variation is packages that provide essentially the same database system on both PC and mainframe. Although it may be supposed that many mainframe database vendors are hard at work moving

their sophisticated software to the PC, the most notable example is the *Focus* system from Information Builders Inc. IBI has actually been shipping *PC/Focus* for more than a year. The advantage of this approach is that you can easily move back and forth between the PC and mainframe as your application needs dictate.

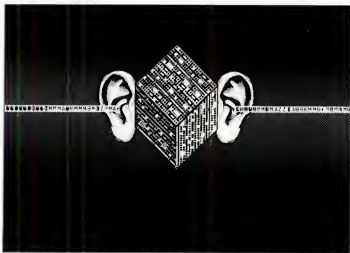
Of course, a database system is not an end in itself. The database is only used as a tool for another purpose—ad hoc information retrieval, remote data entry, or classic data processing applications. Eventually, almost every application will be implemented with a form of cooperative processing between PC and mainframe. One vendor that intends to be strong in this area is MSA (Management Science of America). In 1981 MSA acquired Peachtree Software, and MSA's products today are built around the Peachtree packages. MSA has been a major developer of mainframe software for such things as general ledger, accounts receivable, payroll, and manufacturing. All of these can now be tied to PC products from MSA known as *Peach-Paks*, which provide the usual graphics, spreadsheet, and word processing functions closely coupled to the mainframe applications.

Amid this activity, IBM has kept a low profile. Yet the potential value to IBM of cooperative processing is enormous: Good software sells computers, in this case, both mainframes and PCs. It's no surprise that IBM, too, is starting to move in on this area. The most notable cooperative processing products announced by IBM so far are special workstations (the 3270 PC and XT/370); office automation packages, for example, interfaces to the mainframe *PROFS* electronic mail and filing system; and various document interchange packages for the *DisplayWrite* series.

It probably won't be long before we see a whole flood of software like this from IBM, and mainframes and PCs become more cooperative than ever. ■

THE ASYNC LINK

An asynchronous device is an efficient and economical way to make a main-frame connection—so long as you're not exchanging megabyte-size messages.



The advantages of using your PC to communicate with a host computer outweigh the problems. A successful hook-up would allow you to run programs on the host and to upload and download files between your PC and

the mainframe. But getting your PC to behave as a terminal or establishing an error-free method of transferring files between the big and little machines often poses a big challenge. Problems, such as communications protocols, screen displays, and file formats, can stand in the way of communication between your PC

Big Blue uses its own data alphabet, called the Extended Binary Coded Interchange Code, in its mainframe systems.

and your potential host system.

The First Obstacles

Direct communication between your PC and its potential host depends on the way the data is arranged on the communications line and the data alphabet of the host computer. Unfortunately, the PC uses a data protocol and a data alphabet that are not often found on large IBM systems.

The PC's communications card and most of the serial ports on PC add-on cards are asynchronous devices. The term *asynchronous* simply means that each character is sent down the line along with bits that announce its beginning and end. In fact, the sending and receiving machines don't have to be specially synchronized in order to tell when the bits representing a character start and stop. This method of sending data is efficient and economical as long as the exchanges don't involve megabytes of data. But for many large systems with lots of data to move, another method, called synchronous transmission, is used.

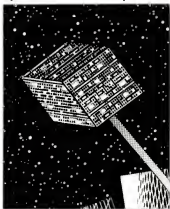
The synchronous transmission scheme packages characters together and reduces the number of start and stop bits used to define each character. This process is more efficient than asynchronous for transferring large blocks of data, but it also requires sophisticated equipment at both ends to keep the synchronization between the sending and receiving machines.

Since many large multi-user computers use synchronous transmission, they can only communicate with PCs in the asynchronous mode through special equipment.

Another potential barrier to effective communications is compatibility between the host computer's data alphabet and the PC's. A data alphabet is the code used by the computer to convert its bits, which represent 0's and 1's, into letters and numbers. For example, Morse code is a data alphabet that arranges groups of long and short pulses into letters and numbers.

Microcomputers use a data alphabet called the American Standard Code for Information Interchange, or ASCII. Many companies use ASCII in their large computers too, except, of course, IBM. Big Blue uses its own data alphabet, called the Extended Binary Coded Interchange Code, in its mainframe systems.

It's important for you to know about transmission protocols and data alphabets if you plan to use your PC to communicate with a host computer. For instance, you have to know if your potential host can communicate using asynchronous ASCII before you can plug the configuration of your PC. Synchronous host systems made by IBM and other manufacturers can communicate using asynchronous ASCII if they are equipped with the proper hardware and software, but if the host isn't appropriately equipped, you may either have to supply a translation device, called a protocol converter, or add special hard-



ware and software to your PC to give it the capabilities you need to communicate.

Communications Software

If your potential host uses asynchronous ASCII, you have several choices of communications software for your PC. Actually, many different programs are

available, but a communications link with a host system makes some special demands on your PC software. At the bare minimum, your communications software should allow you to transmit (upload) and capture (download) data directly to and from your PC's disk without having to hold the data in memory. Programs that have to hold the data in RAM before it is transmitted or written to the disk must limit the size of the files you send and receive. If you need to receive megabytes of data, you don't want to have to do it in 30K-byte sections.

In addition, your software should easily be able to change the transmission and reception speeds and to wait for certain prompting characters from the host computer before sending a line of data. Moreover, it should allow you to create a configuration file that can be loaded with the proper transmission speed, telephone number, and other unique factors for your potential and a file of commands that will automatically boot up into the host system and begin processing.

All of these software features are nice to have, but two features are absolutely necessary in mainframe-to-micro data exchanges: terminal emulation and error-free file transfers.

Terminal emulation is an important consideration if you are trying to exchange data with or run programs on a traditional multi-user computer system. Emulation, of course, means "acting like." In order to communicate with many larger computers, your PC may have to act like a specific kind of terminal that is marketed by one of many different companies.

Computers that service several terminals are usually designed to unload some of the display-processing burden onto the terminals. Terminals that are not usually considered to be microcomputers still contain 6800- or Z-80-type microprocessors. These terminals have software in ROM that causes them to respond to commands

from the host computer in certain ways. A simple terminal, such as the Lear-Siegler ADM-3A, may only be able to blank the screen, display reverse video, and ring its bell in response to commands coming over the data line. Other more powerful devices, such as the IBM 5080 graphics workstations, can illuminate any pixel on the screen, display two- and three-dimensional drawings, and rotate figures on the screen.

Program designers usually assume that a certain type of terminal will be used with their software and develop routines that are specifically designed to take advantage

of the terminal's capabilities. It's too bad terminal manufacturers haven't settled on a standard set of commands that always cause specific actions to take place. ANSI has published a standard set of commands for terminals; in fact, you can configure your PC to use this display standard for programs you run on your system by loading the ANSI.SYS file that comes on the DOS distribution disk. But unfortunately, like the RS-232C signaling standard, the ANSI terminal standard is used, interpreted, and ignored by different manufacturers in many different ways. Furthermore, manufacturers often use unique



CROSSTALK XVI

Microstuf, Inc.
1000 Halcomb Woods Pkwy.
Roswell, GA 30076
(404) 998-3998
List Price: \$195

Requires: 128K RAM, serial card, DOS 1.1 or higher, two disk drives recommended.

CIRCLE 789 ON READER SERVICE CARD

COMM

Hawkeye Grafix
23914 Mobile
Canoga Park, CA 91307
(818) 348-7909
(213) 634-0733
List Price: \$199

Requires: 64K RAM, DOS 1.1 or higher, one disk drive.

CIRCLE 790 ON READER SERVICE CARD

BLAST

Communications Research Group, Inc.
8939 Jefferson Hwy.
Baton Rouge, LA 70808
(504) 923-0888
List Price: \$250

Requires: 128K RAM, async port, one disk drive, DOS 2.0 or higher.

CIRCLE 791 ON READER SERVICE CARD

SmarTerm 125

Persoft, Inc.
2740 Ski Ln.
Madison, WI 53713
(608) 273-6000
List Price: \$295

Requires: 256K RAM, one double-sided disk drive or a hard disk, color monitor with IBM Color Graphics Adapter or monochrome monitor with Hercules-compatible graphics adapter, async I/O board, DOS 2.0 or higher.

CIRCLE 792 ON READER SERVICE CARD

SmarTerm 400

List Price: \$250
Requires: 128K RAM, async communications port, one disk drive, DOS 2.0 or higher.

CIRCLE 793 ON READER SERVICE CARD

Kermi

Kermit Distribution
612 W. 115th St.
New York, NY 10025
(212) 280-3703

List Price: \$100 for postage and handling of nine-track magnetic tape.
Requires: 128K RAM, RS-232C async port, floppies not supplied.

CIRCLE 794 ON READER SERVICE CARD

The VT-100 terminal offers features that, in some ways, exceed the emulation capabilities of the PC.

commands in their terminals that may not even be consistent through their own product lines.

These inconsistencies make it difficult to design general-purpose communications software for terminal emulation. Because they can't meet everyone's needs and because of the extra work involved, most communications software packages for the PC do little more than clear the screen and ring a bell. The most simple communications programs don't give the PC the ability to respond to any other external commands. If you connect a PC running one of these programs to a larger computer and then use the programs on the larger machine, you may find many strange characters displayed on the screen and maybe even a display with awkwardly grouped lines of text.

ASCII Terminals

The most popular group of asynchronous ASCII terminals used in the United States is the VT-100 family, manufactured by DEC. Several good full-screen editing programs have been written for the VT-100 under UNIX, and many other popular UNIX programs were written with the expectation of being able to take advantage of the capabilities of this terminal. The VT-100 has even been cloned by Japanese manufacturers, who have successfully sold a nearly identical product.

The VT-100 terminal offers features that, in some ways, exceed the emulation capabilities of the PC. For instance, it has a smooth scrolling feature that makes text literally flow onto the screen. Users who get used to smooth scrolling find other terminals' scrolling jerky and intrusive. The VT-100 can display 132 columns of double-high and double-wide characters and text. The PC can't duplicate these functions directly, but some programs offer good alternatives. Fortunately, because of its popularity, several good communications packages with VT-100 emulation are

available from numerous vendors.

Other common asynchronous ASCII terminals include the Heath/Zenith H-19, the IBM 3101, the ADM-3A, and the Televideo 900 series. The IBM PC can't emulate all of the capabilities of all of the commercial terminals on the market, but it may be important for you to find PC software that can emulate at least most of the functions of the terminal to which your host computer expects to be connected.

Error-Detection Protocol

The files and messages you exchange with other PCs and host computers over local and long-distance communications links are made up of a stream of bits. One bit of data is a very short electrical pulse. It can be disturbed by many kinds of noise intrusions in the circuit path. Also, if bits are garbled or destroyed, the value of one or more characters can be changed. Because bad data may be worse than no data at all, many data communications systems are designed to detect errors and react to them. Some very sophisticated systems use error-detection and correction software that can reconstruct garbled bits through statistical analysis. But most communications systems involving microcomputers use a scheme called an error-detection and retransmission protocol.

The error-detection portion of an error-detection and retransmission protocol works by statistically analyzing a block of characters before it goes out and then transmitting the results of that analysis to the receiving end. The receiving system performs an identical statistical analysis, and, if the results are the same, it assumes that the received block is the same as the transmitted block. If the results of the statistical analysis don't match, then the receiving system asks for a retransmission of the block. A preset number of retransmissions can be made until the limit is reached. At this point, the systems tell their respective operators that they

couldn't get the job done.

The Xmodem Protocol

Several popular error-detection and retransmission schemes are used in the micro world. One common scheme, the *Xmodem* protocol, was developed by an early bulletin board system pioneer, Ward Christensen. This protocol uses 128-byte blocks. As each block is sent, a "checksum" byte, which is derived by summing certain numeric characteristics of the data block, is attached to the end. The sending machine waits until an acknowledge signal (06 hex) comes back from the receiving side before sending the next block. The send-wait-send system works well on the average communications circuit that doesn't have too much noise or too long a delay between the end of a block and the receipt of an acknowledgement. The *Xmodem* protocol is used in the *Modem7* communications program. *Modem7*, a public-domain program, is widely available through computer clubs and electronic bulletin boards. The *Xmodem* protocol is also found in other data communications programs.

Kermit the Protocol

A team of Columbia University computer scientists, headed by Frank da Cruz and Bill Catchings, has been working on the problem of moving files between microcomputers and mainframe systems. They have inspired a grassroots movement in the academic and government worlds to make available a large number of low-cost (essentially free) programs for many different systems that use the same error-detection and retransmission protocol. They call the protocol *Kermit*, which is named after the famous television and movie frog.

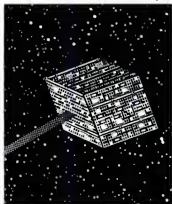
Columbia University has been the center of activity, but the actual work of developing the various programs has taken place across the United States, Canada,

and the rest of the world. Columbia offers a nine-track magnetic tape with source code versions of full *Kermit* programs for nearly every major mainframe and microcomputer used in the West (including PC- and MS-DOS versions) for \$100. I know from experience that once compiled these programs run well.

Kermit will probably become a part of many other commercially available and public-domain PC data communications programs in the near future. Local PC user groups and PC-oriented bulletin boards offer PC versions of the *Kermit* program. The PC version of *Kermit* emulates the Heath/Zenith H-19 terminal that is recognized by most UNIX systems.

Transmission Delay

Error-detection and retransmission protocols, such as *Xmodem* and *Kermit*, pro-



vide an accurate and rather simple method of ensuring that what you sent is what the other end received. But these protocols take some time to do their job. Normally, the time you spend waiting for an acknowledgment is small, and it doesn't amount to an appreciable percentage of the total transmission period. Incidentally, satellite communications circuits and some specialized data networks don't pro-

vide this error-detection service. But changes that are currently taking place in the country's communications systems are greatly increasing the odds that you might soon try to use an error-detection protocol over a satellite communications circuit and not know it (see Derfler's "Data by Satellite" in this issue).

Making the Right Choice

You have many things to consider when you try to link a PC with a large host computer. Some of the problems, such as the data alphabet, are very basic; others, such as the finer points of terminal emulation, are subtle. The programs I review in this article are only a small sample of the well over 100 data communications packages available for the PC. And the variety of mainframes is nearly as great. Consequently, I recommend that you research your problem well before you spend money and time trying to communicate with the "big guys." To improve upon an old adage, look before you link.

CROSSTALK XVI

CROSSTALK XVI, distributed by Microstuf, is a popular data communications program. This program is important to PCjr users because the latest release disk (3.5) includes a version for the PCjr at no extra charge. This is the best way I know of to turn the PCjr into a sophisticated and relatively low-cost data communications terminal with terminal-emulation and error-detection features.

CROSSTALK XVI uses the *Xmodem* protocol, but it also offers a slightly different type of error-detection and retransmission protocol with greater flexibility. The *CROSSTALK* protocol allows the operators at each end of the microcomputer communications link to select the size of the block that is used for statistical checking. If the communications path is good, then the chances of a successful transfer are high. Under these conditions, you

CROSSTALK has the ability to write data to the disk while it is receiving data.

would set the program to use a large block size (*CROSSTALK* allows up to 2,560 bytes). The larger the block, the fewer times the program has to stop and wait for a confirmation. This process gives you better efficiency and lower phone bills. On the other hand, if the transmission path is bad, then the selection of a small block size prevents the program from retransmitting needlessly large amounts of data many times to get it through.

CROSSTALK XVI provides very good terminal-emulation capabilities. A menu allows you to select between DEC VT-100 (actually, the advanced VT-102), IBM 3101 (an IBM async ASCII terminal), Televideo 910/920, and the ADDS Viewpoint. This combination covers most of the capabilities provided by asynchronous ASCII terminals. This program won't give you the 132-column mode available in the DEC VT-100, but it does offer almost all of the other major features of the terminals it emulates.

Sending files to a large host system can be tricky because the host system often can't handle an uninterrupted stream of incoming data and different hosts indicate their readiness to receive lines or blocks of data in different ways. *CROSSTALK XVI* has a wide variety of options associated with file transmission. One option even allows the program to watch and "learn" the transmission prompts sent by the host.

In addition, *CROSSTALK* has the ability to write data to the disk while it is receiving data. The PCjr version can do this too. *CROSSTALK* offers many other features, such as recall buffer, which allows you to go back and look at something that has already scrolled off the screen. These special features have been developed over the many years this program has been on the market.

A feature of *CROSSTALK XVI* that is especially useful for mainframe communications is its ability to create command

files that can control the program. These files can direct the program to make a connection (either over a modem and telephone line or over a direct RS-232C cable connection), sign into the mainframe, send commands to the host to run programs, capture or send data, and sign off without anyone being present. You might not want your process that fully automated, but automatic sign-on features certainly relieve some of the problems of interaction with large, shared computer systems.

SmarTerm

A family of PC communications software that you should also be familiar with is the *SmarTerm* family from Persoft, Inc. This family comes in versions designed with nearly perfect terminal-emulation capabilities. Each version of the *SmarTerm* software will only emulate one terminal or terminal group, but it does so very well. For example, *SmarTerm 125* will emulate the DEC VT-102 terminal and even offer 132-column capability by horizontal scrolling of the screen. Under the special DEC VT-125 emulation, it responds to color graphic commands in a properly equipped PC. *SmarTerm 400* emulates the Data General D400 terminal and can display multiple windows, vertically scroll and erase windows, and respond to other unique commands. If you need all of the capabilities of a specific terminal, you should consider the *SmarTerm* programs.

The programs in the *SmarTerm* series can use either *Xmodem* or their own protocol for file transfer. They read and write directly to disk so the size of the captured file is not limited by the RAM space of the PC. The *SmarTerm* programs cost between \$150 and \$295.

Error-detection and retransmission protocols are important in both micro-to-micro and micro-to-mainframe communications. But the difficult part of using

these protocols with large host computers is writing and installing the protocol software for the big machines. Very little software is currently available for the big machines that will use the *CROSSTALK* protocol. Some corporate data processing offices have written software to use *Xmodem* on big systems, and *CROSSTALK XVI* will also use *Xmodem*; however if you don't have the time, people, or money to write your own mainframe software, you can either buy a commercial product or go look for help from *Kermit*.

COMMx

For several years, a small company named Hawkeye Grafix has been marketing a good communications program with a matching FORTRAN source code package that can be compiled for DEC 10 and 20 and various Hewlett-Packard and Honeywell host computers.

This package, called *COMMx*, has its own unique protocol file-transfer routine that uses 7-bit data words. This file is important if you are trying to move your data over a system, such as Telenet, that only accepts 7-bit words. In addition, if you move a lot of words, you will eventually save a considerable number of bits in transmission.

COMMx is menu-driven. With it, you can use the *Xmodem* protocol, compress files for economical transmission, keep a "log" on disk of all outgoing and incoming data, and change the function of certain keys to make communications easier. The program writes and reads directly to and from the disk.

COMMx has terminal-emulation capabilities, but you have to do quite a bit of work to use them. You can change the way the program responds to incoming commands and customize certain keys, but doing so is not so simple. You have to know what you want and instruct the program to respond appropriately. In other words, you have to be a fairly sophisticat-

ed programmer to make *COMMx* react like a specific terminal and find great flexibility in the program.

The FORTRAN source code for the big computer versions of *COMMx* sells for \$1,500. The PC version of the program has a list price of \$150. If you are an ADP professional, *COMMx* could provide you with most of the makings for a customized PC/mainframe link.

BLAST

One commercially available communications package, which has versions available for large mainframe computers, uses



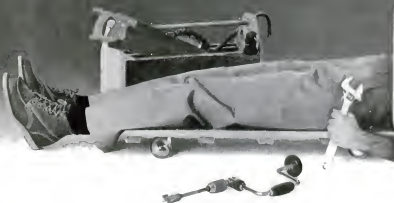
a transmission scheme called Blocked Asynchronous Transmission, or *BLAST*. *BLAST* is marketed by the Communications Research Group. The *BLAST* protocol is designed to be efficient over communications paths that have long delays. The program sends data blocks out in a steady stream and simultaneously collects acknowledgements or requests for retransmissions as they come in. It responds to the retransmission requests

"on the fly" without losing efficiency. This high efficiency is very valuable, but equally important to most corporate users is the fact that versions of the *BLAST* software with a "sliding window" are available for many different micro, mini, and mainframe computer systems. This window means that you can load *BLAST* on your PC and use its efficient error-detection protocols to exchange files with a DEC PDP-11, Honeywell DPS-8, IBM 370, and others.

If you compare the MS-DOS version of *BLAST* with other data communications software for the PC, such as *CROSSTALK XVI*, it comes out looking pretty spartan. This program has no terminal-emulation capabilities, and I believe that the ability to act like a specific commercial terminal is a must in the sophisticated marketplace in which *BLAST* competes. *BLAST* can let you exchange files with a DEC mainframe, but if you can't emulate a VT-100 terminal, you may have a difficult time seeing the screens that allow you to create and call up the files you need.

The PC-DOS version of *BLAST* asks you to copy a file called *LINK.EXE* from your DOS disk and to name and link the *BLAST* program modules you want before you run the program. These modules customize the program, and you can't change too many communications parameters after the program is linked. Even after it is linked, *BLAST* doesn't do some fairly simple things for you. For example, the program will automatically send the *ATD* instruction that gets the attention of a Hayes modem if you call the right *BLAST* module in the original link, but once the modem goes on line, the menu still stares at you from the screen. You then have to select a menu option and work your way into the on-line mode. Maybe I am spoiled by such programs as *CROSSTALK*, but in my opinion *BLAST* lacks a lot of bells and whistles that would make it easier and smoother to use. ■

WE TURN YOUR PC INTO A GRAPHICS TERMINAL WITH VTERM/4010



The original VT100 terminal emulator for the IBM PC has something new under the hood: Tektronix 4010/4014 emulation. Now you can use one powerful, well-built software package for mainframe graphics, terminal emulation and file transfer.

VTERM/4010 gives you all of the features of VTERM II, plus Tektronix graphics. It can run mainframe graphics applications from SAS, ISSCO, Tektronix (PLOT 10), Precision Visuals, and many other similar packages. And VTERM/4010 will save pictures on disk, or draw them on Hewlett-Packard and IBM plotters.

But that's not all. As thousands of users know, the VTERM communications line comes standard with these exceptional features:

- Complete VT100, VT101 and VT102 emulation.
- Full throughput to 9600 baud.
- A highly reliable error-free file transfer with CRC checking, including complete host software for several host operating systems.
- XMODEM file transfer also supported.
- An ASCII file transfer system with a wide variety of options that allow exchanges with most host systems using only standard host utilities.
- Optional 132 column display using a special display adapter available from Coefficient.
- Autodialing, on line help, and a unique softkey command system that lets you automate many communications functions.
- Easy-to-use setup screens always accessible with a single keystroke.
- Multiple setup files.
- A "hot-key" that lets you switch instantly back and forth between DOS and VTERM without ever losing your terminal screen or communications link.

Get the picture? VTERM II gives you DEC terminal emulation, file transfer and lots more. VTERM/4010 gives you all that plus Tektronix graphics.

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Coefficient Systems Corporation (212) 777-6707 611 Broadway New York, N.Y. 10012

The Local Area NetWorld™

Open up your world with DMS HiNet™ networked systems, the solution to your needs for communications, data storage and security, personal computing, and reliable backup. Where others provide only components, we provide everything — IBM-compatible workstations, interface cards for IBM PCs™ and compatibles, high-capacity hard disk storage, network and operating system software, and cabling.

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The enhanced DMS 816 PC-compatible workstation with high resolution graphics takes advantage of MS-DOS™ the wealth of PC-DOS™ software, and CP/M-86™ or CP/M-80™ programs. For special purpose graphics applications, such as Computer-Aided Design, the DMS 5000 series HiNet workstations provide computational speed and very high resolution at an incredibly low cost per user.

Digital Microsystems

If you already own IBM PCs or compatibles, connect them to HiNet with HiNet/PC Adapter cards. Conserve your investment while expanding the utility of your system.

Our new streamlined master server offers a wide range of hard disk capacity, plus flexible backup options. And the DMS MimicMaster™ brings no-fault computing to the network world by offering true redundant processing.

Some of the largest firms in the world utilize Digital Microsystems' HiNet networked systems for distributed data processing, micro-mainframe communications, and data security. They know they have the support of an international company, which is part of Extel Group PLC.

If you'd like to enjoy the productivity that a networked system provides, call or write the people at Digital Microsystems today for information on HiNet. **You'll net the world.**



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CIRCLE 222 ON READER SERVICE CARD

DATA BY SATELLITE

While satellite communications have many advantages over other telecommunication links, distances between the satellite and earth delay transmission time.

If you haven't been confused by what's happening in the U.S. telephone industry, you haven't been paying attention. The old reliable telephone company has gone through some big changes, and the industry itself is in the middle of a cataclysmic transformation. Your phone bill, your service, and the way you move data from your PC through the telephone network are all affected.

Competition in Communications

The divestiture of the Bell System, the Computer II decision of the Federal Communications Commission, and the move toward "equal access" for competing long-distance telephone companies have given you a wide range of ways to move voices and data across the country. You have to make technical choices about telephones and long-distance carriers that you never had to make before.

Now, many companies would like to sell you long-distance telephone service. You are probably familiar with AT&T

Communications (part of the old Bell System), MCI, and GTE Sprint, and you may know of other carriers that serve your area. But if you are trying to choose a long-distance telephone service for your single line at home or for the 100 lines in your office, you need to know how the path your signals travel affects your voice and particularly your data communications.

The Old Days

Prior to January 1, 1984, you probably relied on AT&T for your long-distance telephone calls. The system used to work this way: in 1983, for example, if you lived in Florida and dialed a phone number in Montana, your call would probably have been routed over transcontinental buried cables and microwave radio links. The airline distance between Florida and Montana is about 2,300 miles, but the actual physical distance your signal traveled was probably longer because of the routing of the communications circuits.

Say the signal path was 3,000 miles. At the speed of light, the sound of your hello



took just about 30 milliseconds to go from Florida to Montana. If you used your PC to communicate with another computer in Montana, it would take about 30 milliseconds for the modem tone representing a bit of data to traverse the system, some finite time for the computer on the other end to generate an echo of the character, and 30 milliseconds to receive the echo.

The response time of this kind of circuit gives you an excellent path for communications. If you are communicating by voice, you can interrupt the person on the other end, help finish a thought or a sentence during conversation, and tell Jack-Benny-type jokes that rely on timing to be funny. If you are sending computer data over this kind of circuit, you can use programs that pause occasionally to check the accuracy of the data transfer.

Mirrors in the Sky

The science fiction writer Arthur C. Clarke is widely credited with publicizing the idea of using artificial satellites for communications. Many of us were adults

when words like Telstar and Echo 1 entered our vocabularies. The technology is new, but the idea is simple.

A communications satellite is a large repeater in space. When you send a signal up to it, the signal is regenerated and retransmitted back down. The satellite has many advantages over microwave radio and cable links: it can't be cut by a backhoe, as cables are every day; it isn't usually affected by the weather and atmospheric effects that can disrupt other forms of radio communications; and it is within line-of-sight coverage of a large chunk of the Earth. (See Figure 1.)

On the other hand, putting a satellite into space requires spending a great deal of money up front. It is a somewhat risky business as well. And the distance to the satellite causes propagation delays that can result in inefficient communications.

Communications satellites normally hang about 22,000 miles up, in an orbit around the Earth's equator. This position means that your signal has to traverse a minimum of 44,000 miles if the ground

stations are directly under the "bird," which they are not. On the average, it's safe to assume about a 60,000-mile station-to-station path. Your hello sent from Florida to Montana over a satellite link will make the trip one way in about 600 milliseconds. So, to hear from the distant end, you will wait at least 1.2 seconds owing only to the time the signals require to cover the distance. (See Figure 2.)

If you've tried to carry on a conversation over a circuit like this, you know it takes patience. Attempts to interrupt the speaker at the other end usually result in a collision of voices. The timing is off, and it's difficult to give the person on the other end the verbal feedback that's part of normal conversation. Your voices will often overlap. The circuit is usually clear as a bell, but the delay is significant, even to humans communicating at relatively slow voice speeds.

The delay may be even more significant for computers. If you send computer data only one way, and your system doesn't wait for an echo or checksum, you don't care about the delay. But if your system uses an error detection and retransmission protocol, the delay can increase the time it takes to transfer a data file by as much as 80 percent.

Communications satellites normally hang about 22,000 miles up, in orbit around the equator.

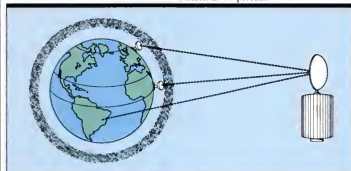


Figure 1: A communications satellite serves as a relay point in space. Because the satellite is so far away, the time it takes for a bit of data to go from the Earth to the satellite and back again can have a great impact on the efficiency of data communications systems.

Stay on the Ground?

You might think the obvious solution is to avoid using satellite links for computer communications. But that decision is becoming less practical and possible every day. The alternative long-distance telephone companies are getting large shares of the market because they offer economical service. Many of them use satellites to carry communications, and there's almost no way you can tell those that do from those that don't.

Companies with offices in several cities may find it economical to lease private lines between offices on a permanent basis. These leased private lines can reduce the cost of doing business and allow companies to use services such as video conferencing and high-speed data transfer without spending the year's profits on the phone bill.

Many of the newer long-distance carriers use satellites to link busy communications paths between major cities. They use microwave systems too (GTE Sprint has a very large microwave network), but they use a large percentage of satellite links for distances over 500 miles because of certain cost advantages and the speed with which a system can be expanded. At this time, plenty of space is available on existing satellites, and companies can add new cities to their service areas by simply leasing space on a satellite transponder and rolling a ground station into the parking lot of their local office. That's a lot easier than trying to buy more land to put up microwave towers or getting permission to dig trenches for cables.

All this action in the communications world means that you might find yourself using a satellite link to call just from one end of your state to the other. The same error-detection and retransmission protocol (see Derfler's "The Async Link" in this issue) that worked so smoothly over land lines can become very inefficient when it travels long paths to the mirror in

the sky. That inefficiency can transform a cost-saving communications service into a very costly one.

Value-Added: No Bargain?

Additionally, other new ways to move your communications are being offered by a growing number of companies. These value-added services, such as Tymnet and Telenet, digitally transmit your data among different locations on their nationwide networks. They will also adjust the speed and translate the signaling schemes of various terminals and computers attached to the network so that they are compatible with each other. These services are becoming increasingly popular and competitive, but they too have limitations.

While your data is error-checked when it passes through the value-added network, your connection to the network is usually through the potentially noisy local telephone systems at both the transmitting and the receiving end. Local noise and interruptions could still garble data, so there's very good reason to use an error-detection and file-retransmission protocol, even if you are using a value-added data network to communicate among computers.

All the buffering, manipulating, and error-checking done on a value-added network takes time. The delay in getting an acknowledgment back through one of these networks can be greater than the delay experienced on a long satellite link. Since some networks integrate satellite links into their transmission facilities, the total delay can be compounded if you are using the network to communicate over long distances. Again, a communications service that is supposed to be beneficial can become a real burden if you try to send the commonly used microcomputer error-detection protocols through it.

You can use an error-detection and retransmission protocol efficiently in a couple of ways, despite the delay of a sat-

ellite link or value-added network. First, if you use the *CROSSTALK* communications package, you can take advantage of the fact that satellite circuits and data networks are generally high quality and use the largest possible block size for transfer. This reduces the number of times the programs stop and check the data and returns the process to a reasonable level of efficiency, particularly if the files being transferred are smaller than 100K or so. But if the files are large, the accumulated delays can be

system completes the transmission of the block in progress, recalls the troubled block and sends it again. Given excellent or even good path conditions, this kind of "sliding-window" response, where an acknowledgment may come after several blocks have been sent, is a practical method when using satellite links. The *BLAST* communications package (see Derfler's "The Async Link" in this issue) provides this kind of sliding-window response. And changes proposed for the *Kermit* protocol



Figure 2: The send-wait-send type of error-detection and retransmission protocol can be very inefficient when the long circuit path increases the wait for the reply.

large, even with the maximum block size.

The second way you can efficiently use a satellite communications link with an error-detection and correction communications program is to modify the protocol software to meet the unique conditions of the link. After all, computers can easily store and recall information they transmitted and received, and there's no real reason why they should just wait for a reply. The checking and acknowledging scheme of the error-detection and retransmission protocol can be modified so that data are sent in blocks with a checksum, but the sending system doesn't wait for a reply before moving out the next block.

The acknowledgments sent from the receiving end are coded to show the block of transmitted data to which they relate. If the sending system receives a positive reply to a block that has been gone for several seconds, it reads the reply and then throws it away. If the system receives a request for a retransmission, the sending

would give it the sliding-window feature also.

Be Choosy

If you use data communications often, you will probably find it worthwhile to choose a long-distance carrier on the basis of quality not price. But the quality of any carrier is impossible to predict accurately. The systems are changing so quickly that a company that does a great job linking two specific cities may do a terrible job in a third. You have to try a company's services to see how they perform. Communications companies seem to respond well to complaints, and you can terminate or begin service quickly. So be choosy. You can afford it.

Also, after you have found a company with good service to the places you want, be sure to select your PC communications software with equal care. It's a lot harder to take a software package back than to cancel a telephone service. ■



WHEN THE MINI PLAYS HOST

IBM's System/38, a business-oriented minicomputer, can link up with PCs to make them do double duty, switching between application and emulation.

Forget the mainframe! The new superminis outdo the traditional "iron" in sophistication, uptime, communications, accessibility, and ease-of-use—in just about everything, with the notable exceptions of speed and capacity.

The minicomputer has the edge over micros in speed, capacity, and programmer productivity and surpasses mainframes in ease of data access and cost—while a mainframe CPU by itself can cost millions of dollars, an entire minicomputer setup with many terminals is normally only several hundred thousand.

Many companies want to multiply their processing power by connecting minis with micros, just as their counterparts using mainframes do. A growing number of smaller organizations have achieved remarkable results by linking PCs with minicomputer hosts.

One of the biggest success stories in small, general business-oriented minicomputers is the IBM System/38. The advanced features of this supermini make it a programmer's dream: built-in relational database; virtual storage; 32-bit, object-oriented architecture with system software built for 46 bits; 16 megabytes main storage (memory); binary-tree method indexing (which eliminates the need to sort files); and something IBM calls Single Level Storage Management. This last item, IBM states, means that the S/38 treats all data as if they were in memory. Therefore, when magnetic disk storage gives way to instant-access memory devices such as bubble memory or CCDs, the S/38 will be ready to accept them.

IBM and a few other companies have products available for those owning the System/38 that enable PC users to have a high degree of access into the systems. Following are the stories of two businesses that have successfully used the mini-to-

microcomputer connection to streamline their operations.

Toward a Central Database

To many, the name "Rockefeller Group" conjures an image of a clan of multimillionaires at a family reunion. In real estate circles, however, the Rockefeller Group is known as a relatively small, powerful, privately held corporation with a strong position in real estate and growing interests in the communications field. Besides operating New York City's Rockefeller Center, a virtual city within a city, and nearby Radio City Music Hall, the company owns Cushman & Wakefield, a large, nationwide real estate services company headquartered in New York. A recent Rockefeller Group acquisition is Outlet Communications, which owns radio and television stations around the country.

The company has had a long relationship with IBM small systems, starting with a System/360, then moving onto a System/3, System/34, and now a System/38. It is a progression mimicked by many smaller IBM customers. Both the System/360 and the System/3 were batch-processing machines. The System/34 marked the era of on-line processing. Terminals scattered across the accounting department could do interactive data entry, program initiation, and some inquiry. The decision to upgrade to the System/38 was a result of plans to create a central database that could be tapped by financial analysts throughout the organization.

Most conglomerates, particularly those with a decentralized approach to their subsidiaries, such as the Rockefeller Group, devote much manpower to tracking, analyzing, and projecting financial data. For the most part, the financial analysts work with the same body of data. For example, a group of analysts might work with the current year's financial figures for one of

The first application of the System/38 was to give the planning and finance people a common database.

the company's subsidiaries. But each analyst will be concerned with different aspects of the data. One person might compare yearly expenses for just one item across all subsidiaries. Another might want to compare one company's first-quarter expenses against the same expenses last year. Moreover, owing to constantly changing figures, people working on the same problem might have different numbers depending on when they accessed information. Getting everyone "to sing out of the same hymnal," as one vice-president put it, is a key management objective.

The first application the Group wanted to put on the System/38 was the Corporate Analysis and Planning System (CAPS). CAPS was designed to give the planning and finance people a common database of financial plans, taxes, budgets, and accounting data. Carol Agins, director of management information services for the Rockefeller Group, and her staff felt that the power and flexibility of the PC/spreadsheet combination could be maximized if used in conjunction with CAPS.

Easy Access

The responsibility for providing access to CAPS through the PCs fell on Dave Wills, a systems analyst with the Rockefeller Group. His objective was simple—to provide the analysts easy access to financial data stored on the System/38.

The physical link was easy enough. IBM had just introduced (early in 1983) a terminal emulation board. The board, which is installed in the PC, allowed direct twinaxial cable attachment to the System/38 workstation controller. To the System/38 using a terminal emulation board, the PC looks like a 5251 Display Station and provides standardization in much the same way a 3270 does in the mainframe world. Functionally, having the PC with the emulation board is like owning both a full-functioned 5251 terminal to the System/

38 and a regular PC. A "hot key" shifts between the two modes. Installation of the first board went relatively smoothly save for some switch-setting errors in the original documentation.

With the physical connection established, Wills set about providing access to the System/38 data files. His main tool was a set of utilities IBM introduced concurrently with the emulation board. The utilities allowed programmers to create a file on the System/38 that PC-DOS thinks is residing on its own disk. This "virtual" disk, in ASCII and formatted according to PC-DOS standards, can be accessed by the PC like a regular disk file or downloaded (copied) to a real disk.

Important as these File Support Utilities were, they were only tools to access information. The users needed current, forecasted, and historical financial data on all of the Rockefeller Group's companies. Wills created a single database file on the S/38 containing the needed information.

The last hurdle was integrating all of these elements into a user-friendly system. To achieve the final user interface, Wills employed three different languages: The main file inquiry program was in COBOL. RPG III, the language IBM designed especially for the System/38, was used to modify and simplify the File Support Utilities IBM provided. Finally, the various modules were linked by CL (Command Language), a compilable language providing program loading, file opening, and general job-stream control.

The resulting user interface for a particular application is deceptively simple. The application is menu driven and fill-in-the-blanks style. Users are presented with a menu selection that opens the S/38 file. Then they are presented with a field-selection screen clearly indicating the year, month, and description. By marking the areas with Xs, users choose exactly what they need. They can make selections with comparisons to a constant, comparisons to

5251 Emulation Boards

Local and remote connections between IBM minis and PCs are possible with these hardware/software combos. Here's how to choose the right one.

If your organization has an IBM System/34, /36, or /38, you can connect your PC so that it becomes a terminal to the system and you can upload and download files. Various hardware and software on the market allow PCs to emulate the IBM 5251 display station, the standard video display terminal for these small systems. Only one product, however—the IBM 5251 Emulation Board—provides for direct cable attachment to System/3x workstation controllers.

Other emulation boards emulate a 5251 Model 12, a relative of the 5251 that contains a built-in communications adapter. The Model 12 emulation boards attach through a communications adapter on the S/3x at a cost of several thousand dollars. Modems are also required for nondirect connection.

Choose the product based on whether you'll be accessing the mini with cable (local) or via telephone lines (remote).

The 5250 Emulation Board is a full-size board that allows the PC to operate either as a PC or as a 5251 display station. Switching back and forth between the two modes is accomplished by the touch of a "hot key," which suspends current operations on the last mode used until return. Transfer rate is very high—about 1 million bits per second as carried by twinaxial cable. The connector on the back of the PC allows serial cabling so that multiple PCs and 5251s can reside on a single string. The 5250 Emulation Program is included on disk. While in emulation mode, the PC has access to all the functions of the host system that are available to a display-station operator.

The IBM System/3x-PC File Support Utilities provide programs, including source code, to create a "virtual" disk file on the host, which can be accessed interactively or downloaded to the PC disk. The utilities do the EBCDIC-to-ASCII character translations.

Techland's Blue Lynx is a hardware/software combination that allows PC or PC-XT connection to a System/3x through synchronous modems, modem eliminators and phone lines, or in-house wire connection. It supports switched, leased point-to-point, or multipoint lines at speeds from 1,200 bps to 9,600 bps. Any parallel printer attached to the PC emulates an IBM 5256 dot matrix printer. Nearly all functions of the 5251 are supported. Unlike the IBM board, Blue Lynx does not offer a "hot key," which means there is no single-key switching between PC and 5251 modes. The PC keyboard fully emulates the 5251 83-key EBCDIC keyboard.

The Emulator Transfer Utility provides a complete disk-access subsystem for the user while on-line with a host. Downloading files is straightforward. There is no "virtual disk" procedure. Features include file uploading and downloading, EBCDIC/ASCII conversion, character string substitution, and customizable translation tables.

The AST-5251 offering from AST Research emulates an IBM 5251 Model 12 and can operate at line speeds up to 9,600 bps. Both the AST board and its accompanying software are equivalent to the Blue Lynx offering. AST-5251 includes a modem eliminator for direct connection to the System/38 communi-

cations adapter. When used in this manner, however, line speed is still limited to 9,600 bps. This makes it much slower than using the IBM board.—S.K.



5250 Emulation Board and File Support Utilities

IBM Corporation
1 Culver Road
Dayton, NJ 08810
(800) 426-2468

List Price: \$250 EB, \$893; FSU, \$300.

Requires: PC or PC-XT, 128K RAM, one disk drive.

CIRCLE 800 ON READER SERVICE CARD

Blue Lynx and Emulator Transfer Utility

Techland Systems Inc.
25 Waterside Plaza
New York, NY 10010
(800) TECHLAND
(212) 684-7788

List Price: Blue Lynx, \$745; ETU for S/34, \$500; S/36, \$500; S/38, \$800.

Requires: PC, PC-XT, or compatible, 128K RAM, one disk drive, synchronous modem.

CIRCLE 799 ON READER SERVICE CARD

AST-5251

AST Research Inc.
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333

List Price: \$790

Requires: PC, PC-XT, or compatible, 96K RAM, one disk drive.

CIRCLE 798 ON READER SERVICE CARD

It is the DialComm application that provides the most use for both the S/38 and its attached PCs.

another field, and comparisons based on calculated results.

The File Support Utilities on the S/38 then take over. They sort/select on the financial database, convert the data from EBCDIC to ASCII representation, do a considerable amount of error checking, and load the resulting data onto the virtual disk. Concurrently, the user's PC fires up I-2-3 to capture the data when they are downloaded. When the file finally arrives from the S/38, it has been automatically formatted for I-2-3 files and clearly labeled so that the analysts know exactly what each cell represents. The system even provides for the creation of sequential I-2-3 files in case the volume of data exceeds the standard file capacity.

Several factors explain the success of Rockefeller Group's micro-mini linkage. The scope of the project implemented was finite, controllable, and standardized. The targeted users required the same pool of information. A single file holding all the necessary information was developed with the application in mind. It was also a standalone application, unaffected by changes in other systems and files residing on the S/38. Finally, and perhaps most importantly, the entire project had a single architect and builder in Dave Wills.

Remote Intelligence at EIC

Across town another S/38 is doing innovative tasks. EIC/Intelligence has linked its minicomputer with micros and what it learned about PCs and the S/38 in the process may change the very nature of its operations forever.

EIC stands for Environment Information Center. Its founder and president, Jim Kollegger, originally intended his company to be just what its name implies. No single source for information on environmental research existed when EIC was formed in the mid-seventies. EIC began by keeping track of publications dealing with environmental issues—books, semi-

nars, periodicals, journals—and indexing them in published directories. EIC's subscriber base is primarily researchers and research libraries around the world.

Clearing the Paperwork

Since its inception, EIC has expanded into other fields, including energy, robotics, and genetics. And its distribution system is slowly evolving from the printed page toward electronic media. Some of EIC's databases can be retrieved through DialComm, the on-line database service.

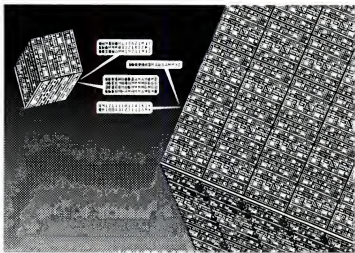
The DialComm application provides the most use for both the S/38 and its attached PCs. Researchers locate articles for the directories and summarize the text. The listing, and the summary, is then keyed into the S/38. After appropriate manipulation, a tape is generated off the S/38 to send to the printers for the print product. Since DialComm's system can only receive data files in ASCII format and the S/38 stores data in EBCDIC, the same files cannot be sent to DialComm's computers directly from the S/38.

Originally, EIC used DialComm's dumb terminals and a simple line editor to rekey the manipulated data into DialComm's system. This generated sky-high connect-time charges and phone bills and was an inefficient use of manpower. The solution? Create a virtual disk on the S/38, download it to the PC, and then "hot key" into PC mode and transmit to DialComm. The micro-mini link was accomplished with Techland's Blue Lynx emulation board. By keying in the text only once and relaying the information to DialComm at the PC's maximum speed, EIC realized huge savings almost immediately.

In a small company such as EIC, where costs are a constant concern, the PC can serve a dual function—when the micros aren't being used to run PC application programs, they can be commandeered for use in conjunction with the System/38. That's taking hardware to the limit. ■

BISYNC COMES OF AGE

The bisync communications protocol allows computers to talk to each other in much the same way that people do, and microcomputer technology brings it up to date.



When someone approaches you on the street, says, "Hello," and starts talking to you, you automatically know that you're not supposed to respond until that

person appears to finish talking. Similarly, when someone wants you to read something, that person would probably prepare you by showing you the document or saying, "Here, read this." Although they occasionally make mistakes, people seem to automatically sense the rules for their interactions.

When two machines need to communicate, however, they must be given explicit rules to follow. One set of such rules, or communications protocol, is bisync. When you program your computer to use bisync, it follows a set of procedures similar to the way in which human beings speak to one another.

Bisync is an integral part of any communications package that enables the PC to connect to an IBM mainframe by emulating a 3270 terminal. Bisynchronous communication has both advantages and disadvantages as compared to asynchronous communication, the most common form of communication used by small computers.

To understand bisynchronous communication, you first have to take a look at asynchronous communication. Async works by including synchronization pulses along with the transferred data. These pulses are known as start and stop bits. They are necessary because data may be transmitted at any time, not just when the receiving computer or modem is ready to accept it. The start and stop bits allow for a great deal of flexibility, but add overhead to the communications line traffic, resulting in slower effective data transfer—or lower baud rates. Synchronous communication, however, uses clock signals that originate from the modem, and these signals are always synchronized with each other. (That's why it's called synchronous.) Bisync is a special type of synchronous communication.

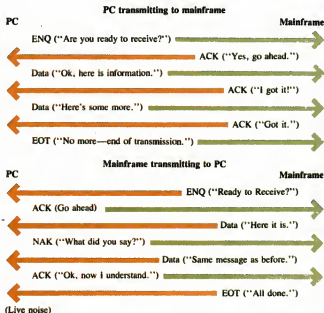
Bisync (an acronym for binary synchronous communication) was created by IBM back in the late 1960s. It describes a set of rules, or a protocol, that two computers can use to communicate with each other.

How It Works

Imagine that you are at a terminal and you wish to transmit some data to a remote computer. You would tell the terminal to proceed to transmit some file, invoking the bisync protocol. Your terminal would send an ENQ (enquiry) character to the other computer (let's call it the host). This is roughly akin to asking the other computer if it is ready to listen to what you have to say. Assuming that it is ready, the host will send back an ACK (acknowledge) character. This is the go-ahead signal for your terminal, telling you to start transmitting data from the file.

After a predetermined number of characters have been sent, your terminal adds one or two check characters, called CRCs, or Cyclic Redundancy Checks. The host calculates these characters based on the data that it receives—just as your station

Typical BISYNC protocol exchange



A conversation of codes occurs here between the two parties exchanging data.

calculates them before sending. If the two calculations differ, the computers know that something went wrong.

Providing that the CRCs match, the host will send another ACK message saying, in effect, "I heard what you said, and I'm ready to receive some more." If the two CRCs were different, the host will send a NAK (negative acknowledgement) message, which tells your station, "Wait a minute, something went wrong during that last transmission. Could you please send it to me again?" at which time your terminal would retransmit the original data.

Finally, when you have properly transmitted all the data in the file, your terminal will send an EOT (end of transmission) character. As you might guess, this tells the host, "Okay, I'm finished sending for now. If you'd like, you can send me something." At this point your terminal will get ready to receive something from the host computer.

This simplified explanation illustrates the basic principles behind bisync. There are also conventions for controlling more than one terminal attached to a single computer, known as multipoint bisync. The protocol has provisions for the host to interrupt the terminal's transmission for a high-priority message, and there are procedures for establishing a connection when one system automatically dials into another. Also, most bisync communication uses the EBCDIC (Extended Binary Coded Decimal Interchange Code) character set, since that is what IBM mainframes use. Since most microcomputers use the ASCII character set, emulators usually include a provision for translating between the two standards.

Bisync History

The story of how bisync came to be a standard owes as much to luck and being in the right place at the right time as it does to good design and planning. In the past, IBM made most of its computers capable

of supporting bisync. One of the most popular was something affectionately referred to as a 2780. This was actually a remote job entry (RJE) terminal that was used to input decks of cards (you remember, those things that you punched your programs and data on) and send them to the mainframe, which was usually located at a different site. The host computer would eventually get around to running your program and then send the output back to the RJE to be printed on its high-speed line printer. After a few years of success with this device, IBM refined the 2780 and called its successor the 3780. Although an improvement over the 2780, the 3780 was still essentially a batch terminal, meaning that you submitted programs and data in a batch and you got the output back the same way. It was, and still is, a good way for many people to use the computer while saving hardware costs.

Interaction

Around this time, though, IBM saw the need for an interactive terminal, meaning one that an operator could use to enter data directly into the computer and receive output back almost immediately. To answer this need, IBM created the 3270, which is also a bisync device. The 3270 terminal is useful for time-sensitive applications because, unlike on the 2780 and 3780, the operator can see and correct mistakes as they occur, rather than having to wait for a printout to come back. The 3270 also incorporates full-screen editing features for application programs. It has several advantages over standard asynchronous ASCII terminals, notably the ability to connect many of them to a host using the same telephone line. This capability is sometimes called multipoint or multidrop. Very simply, this works by giving each 3270 on the line its own address. Before the host sends a message to a terminal, it sends the address of the terminal that the data is destined for. Before a terminal

transmits something, it prefaces its message with its address. Host software keeps track of all the data to make sure that everything ends up in the right place.

As the 2780/3780 and 3270 families became the de facto industry standards for bisync terminals, other manufacturers, such as Data 100 and Harris, started building devices to emulate them. Based on minicomputer technology, most of these devices were as bulky and expensive as the equipment they were intended to replace. Although the technology existed to do more, these early emulators could only read cards, punch cards, and print output—just like the "real" 2780. It has been only recently that manufacturers have



AST-BSC and AST-SNA

AST Research
2121 Alton Avenue
Belmont, CA 92714
List Price: \$696 for AST-BSC; \$895 for AST-SNA.

Requirements: 128K RAM, one disk drive, synchronous modem or modem eliminator.

CIRCLE 785 ON READER SERVICE CARD

SYNC/COM

Dynamic Microprocessor Associates
545 Fifth Ave. #1103
New York, NY 10017
List Price: \$395

Requirements: 48K RAM, one disk drive, bisynchronous board.

CIRCLE 786 ON READER SERVICE CARD

3270 BSC Emulation

System Strategies Inc.
225 W. 34th St.
New York, NY 10001
List Price: \$60,000 (to OEMs only)
Requirements: 96K RAM.

CIRCLE 787 ON READER SERVICE CARD

Asher™ by Quadram.

Turn your IBM® PC into a productive voice/data terminal.



Asher. Communications management for your computer and you.

Organize your personal and business communications quickly, effectively. With Asher by Quadram. Snap Asher inside your PC for a system that works the way you do. Asher begins by partitioning system memory. Load all your programs (Wordstar, Lotus 1-2-3, you name it) just once then toggle between them when your work calls for it. With Asher, program selection is just a keystroke away.

Asher turns your PC into a full-featured telephone.

Asher lets your PC become a computerized telephone, too. Packed with all the features you'd find in an advanced electronic key phone. Place voice calls through the Asher handset (works just like a desk phone) and exchange files or send a screen to other systems through the Asher modem. With Asher, you can even talk and send data during the same call.

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The most important factor in BISYNC's continued sales strength is probably the fact that IBM has offered it for almost 20 years.

begun to take advantage of microprocessor and floppy disk capabilities.

Several companies currently produce microcomputer software/hardware packages for bisync, among them Wilnot Systems, Inc., which makes AST-BSC and AST-SNA (marketed by AST Research and Packaged Solutions, Inc.), Dynamic Microprocessor Associates, which makes SYNC/COM (marketed by Lifeboat and Packaged Solutions), and System Strategies, Inc., the makers of 3270 BSC Emulation. Since the IBM PC has no standard communications interface, it needs a special circuit board to allow it to use bisync. An asynchronous communications board won't do, as bisync requires special hardware. Some of the new MS-DOS compatible machines, such as the DEC Rainbow, Hewlett-Packard 150, and Bytec Hyperion, come with this hardware built in; all you need is a software package to make them work.

Micro Advantage

Microcomputer technology was a natural way to improve bisync. Since the punched cards of old were essentially a mass storage medium, it stands to reason that floppy disks could be easily substituted for them. Today's micro emulators do exactly that, and often go one or two steps further. First of all, a punched card holds 80 characters of data, whereas an IBM PC floppy disk holds 360,000 characters of data, meaning a single floppy replaces 4,500 cards. If the fields are variable length, the actual savings can be even greater, since most cards were not punched in all 80 positions.

Second, as we all know, a floppy can be used as an output device as well, so received output can be sent to the floppy instead of the printer. Since disks generally write faster than printers, you can now receive to disk and print off-line to save on telephone charges. Third, and most importantly, the floppy can hold a program to

direct the emulator's operations. For example, you could create a batch file to tell the emulator to send a logon message, send a program file, receive data to the printer, receive additional data to the floppy disk, send a logoff command, and hang up the telephone, all without operator intervention. These functions were unheard of in the days of the 2780/3780.

Other Advantages

One key bisync feature is its use of synchronous, as opposed to asynchronous, modems. These connect the computer or terminal to the telephone lines at a much more favorable price/speed ratio, as well as provide higher baud rates than are attainable with asynchronous modems. A 2400-baud synchronous modem costs around \$700, whereas its asynchronous counterpart runs about \$1,000. A 4800-baud synchronous modem sells for \$1,500, and you can now get a 9600-baud model for approximately \$2,600. Remember that synchronous modems operate over voice-grade, dial-up telephone lines, allowing you to transmit data at comparatively high speeds without incurring extra line charges.

The most important factor in bisync's continued sales strength is probably the fact that IBM has offered it for almost 20 years, turning it into an industry standard. Other manufacturers, such as DEC, CDC, Burroughs, and Sperry Univac have followed IBM's lead and implemented the protocol on their computers. The software to handle the protocol has been thoroughly tested and debugged, and mainframe applications programmers feel comfortable working with it. The current crop of emulators are, for the most part, plug-compatible with the older hardware, necessitating very little host reprogramming. These factors combine to make bisync a sound choice for data processing managers looking to standardize their communications networks. ■

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3270 PC: ALL THINGS TO ALL USERS?



The IBM 3270 PC is a good first attempt at linking PCs and mainframes, but a variety of factors limits its usefulness.

IBM intended its 3270 PC to bridge the gap between the PC world and the IBM mainframe world. But, for a number of reasons, it gets only mixed reviews. Although information workers have been waiting since the early 1970s for such an all-purpose workstation, IBM's current incarnation of the 3270 PC does not fully live up to its potential.

Both a computer terminal and a personal computer, the 3270's heritage derives from the PC and from IBM's 3270 series of "dumb" terminals. The system unit for the 3270 PC (which IBM calls the 5271 System Unit) is identical to that on the PC-XT. It uses the same motherboard, but the plug-in boards have been changed to enhance performance. The terminal circuitry has evolved from IBM's 3274 Controller, 3278 alphanumeric terminal, and 3279 color graphics terminal, which have been around, with a few changes, since the early 1970s. By keeping one foot in both worlds, the 3270 PC manages to perform many of the tasks that information workers require. It represents IBM's first attempt to create an all-purpose professional workstation, intended to provide local intelligence, local computing capability, direct access to IBM mainframe computers, indirect access to remote computers, graphics capability, and hard copy

output. It even supports multiple-host sessions, allowing a single user to access more than one mainframe at a time or to simultaneously carry out several procedures accessed from a single mainframe. The 3270 PC is IBM's productivity tool of the 1980s, designed to make the micro-to-mainframe connection a reality.

Not a PC

The 3270 PC differs from the PC and PC-XT in its display screen, keyboard, operating system, and price.

The 3270's operating system, called the 3270 PC Control Program, provides windowing capability, multiple-host sessions, a certain amount of concurrency, notepads, an autokeying function, and a data transfer capability. PC-DOS runs as a task under the Control Program.

The most visually striking thing about the 3270 PC is its keyboard. Formally called the 5271 Keyboard Element, it's huge. The tale of the tape indicates that it weighs in at 9.3 pounds and measures 22 inches long, 9 inches deep, and 2.5 inches high. All this real estate houses 122 keys, far outdistancing the PC's 83 keys.

The high-resolution monitor (the 5272 Color Display Element) is also imposing. It has the same resolution as the IBM PC Monochrome Display, but it's in color and larger to boot! The improvement is amazing. The screen is bright and easy to read; the characters are very sharp; and sitting in front of it is not fatiguing, even after a 12-hour day.

As for price, the 3270 PC costs about \$1,000 to \$2,000 more than a comparably equipped PC and more than \$5,000 more than a simple dedicated terminal.

3270 PC Control Program

The Control Program is the 3270 PC's primary operating system, and IBM handles it differently from the way the company deals with PC-DOS. Every time IBM improved or debugged PC-DOS, it



Figure 1: A view of the five key areas on the IBM 3270 PC's keyboard.

released a new version. That's why Versions 1.0, 1.1, 2.0, 2.02, 2.1, and now 3.0 and 3.1 all exist together. On the other hand, IBM treats the Control Program as a mainframe product. IBM issues a release and then provides updates that must be installed by "experts," usually meaning system programmers.

The Control Program's primary positive feature is that it allows concurrent operation. Although only one PC-DOS task can run at a time, it can support up to four mainframe sessions at once. It manages the multiple sessions using a windowing format. The Control Program allows you to partition the screen into as many as seven windows: four for the host mainframe sessions, one for PC-DOS, and two additional windows for notepads. In order to take advantage of the multiple-session capability, you may need to upgrade your 3274 Controller so that it operates in Distributed Function Terminal (DFT) mode.

Monitor and Display Adapter

Although the IBM PC monochrome monitor does work with the 3270 PC, most users will want the color monitor. The color monitor provides high-resolution alphanumeric characters with a resolution of 720 x 350 pixels. The true 14-inch diagonal screen dwarfs the 10½-inch IBM monochrome green screen. The color monitor also comes with its own tilt-and-swivel pedestal to personalize the viewing angle.

Much of the system's increased speed and functionality is due to its dedicated display adapter, which handles many of the windowing functions in hardware, rather than in the Control Program software. Two different graphics boards are available. The PC graphics board, better known as the All Points Addressable (APA) board, provides two color, high-resolution graphics with either 720 x 350 pixels or 640 x 200 pixels. Medium-res-

olution graphics allow the use of four colors with either 360 x 350 pixels or 320 x 200 pixels. The Programmed Symbols Adapter (PSA) board allows the 3270 PC to display IBM GDDM host graphics, but is not as versatile as the host graphics found on the high-end 3270 PC/G and 3270 PC/GX models.

The Keyboard

The 3270's 39 additional keys serve dedicated 3278 functions. The keyboard is arranged in five groups of keys (see Figure

The 3270 PC differs from the PC in its display screen, keyboard, operating system, and price.

1) and includes 10 special function keys for Control Program features; 24 PF keys, which act like normal PC function keys and also handle 3278 functions; a separate cursor pad with adjoining 3278 editing keys; the normal typewriter keys; and a numeric pad.

The PC function keys have been moved from their normal position at the left of the keyboard to a position above the keyboard in a long row. The keyboard looks much like the Texas Instruments Professional computer keyboard, although with many more keys.

These extra keys are a godsend as well

as a curse. Anyone who has ever used a regular PC with an IRMA board will appreciate the keys dedicated to 3278 functions. No longer will you have to put up with doubly and triply defined keys or have to hunt and peck while you consult the keyboard map. At the same time, the extra keys mean that a large percentage of PC software will not work correctly or will underuse the keyboard. For example, the 3270 PC has two sets of cursor control keys and two Enter keys (one is really the Return key). Ordinary PC software requires that you use the normal PC cursor keys and the Return key. Striking the other keys has no effect. When accessing a mainframe, however, you use the Enter key to input a command. This mistake is surprisingly common, even after months of practice. Switching your mindset from mainframe to PC is not automatic!

Second, because there are two cursor arrow pads—one dedicated, the other in combination with the number pad—you can get confused about which arrow to hit. Some software recognizes both arrows, some does not. Finally, the lack of CapsLock and NumLock indicators is a familiar, troublesome problem. The Jump key, used to jump between windows, thus, takes on additional importance. If you inadvertently strike the CapsLock key, the Jump key will cease to function, and you will be locked out until you toggle the CapsLock key again. (continued)



3270 PC

IBM Corporation
Neighborhood Road
Kingston, NY 12401
(914) 385-0123

List Price: \$3,795 for Model 2 (one disk drive), \$4,650 for Model 4 (two disk drives), \$6,210 for Model 6 (10-megabyte hard disk).

CIRCLE 731 ON READER SERVICE CARD

The mainframe software on the other end of the communications link makes transfer very fast.

Multiple Host Sessions

Beyond its physical characteristics, the most important questions about the 3270 PC are how well do its features work, and how helpful are they. For most users, multiple host sessions are little more than a convenience. Applications development personnel will gain the most from multiple sessions. For them, the ability to run another task while also going through a lengthy compilation or data processing task, or the chance to look at a user's job as well as their own, is a major advantage. Ordinary users, however, will require special software to take advantage of multiple sessions. IBM mentions stock brokers and insurance agents as beneficiaries of multiple sessions, but this is true only in cases where existing mainframe software won't do the searching of the different databases for you.

Concurrent PC sessions would have been of more use to professionals. This would allow you to work on a spreadsheet in one window and a word processor in another—and pass data back and forth. While the latest integrated PC software allows you to do this, it is not available on the 3270 PC.

Finding someone to take the responsibility for integrating the 3270 PC into an IBM mainframe network can also be a

problem. IBM representatives often blame the local system implementation when something doesn't work. System programmers tend to blame the network administrator, and network administrators like to blame the controller cabling manager. The cabling manager tries to blame you, the 3270 PC hardware, or the configuration program. Eventually, everyone blames the mainframe applications program and some outside vendor for the inability to communicate with the 3270 PC. In short, the 3270 PC takes you out of the realm of "personal" computing and into a whole "host" of people and possible problems.

Finally, multiple-host sessions can cause logistical problems for their users. For security reasons, each user in an installation normally receives only one user code and password for each mainframe. If you wish to log onto more than one mainframe, or onto the same mainframe more than once, you must not only receive clearance for all these codes, but you must also remember the appropriate logon sequences. Typical installations include a range of systems, such as VM/SP, CICS, IMS, CMS, and MVS/TSO, and all must have their own logon sequences and log-mode particulars.

Autokey can simplify the logon procedure, but IBM's version is no *ProKey*. Activating a stored sequence requires pushing the WS Ctrl key, the Auto key, and the Play key, followed by entering the name of the sequence, such as LOGON1, striking the Enter key, and, after each line of the sequence, hitting the Alt-Pause key combination. Clearly, it's not useful for sequences of less than ten characters.

Unfortunately, the 3270 PC's windows aren't really useful either. The problem is that windows often obscure the "active" area of the screen. Since you can toggle from task to task with a single key, it's far easier to switch screens than to try and work in a restricted window. Occasional-

Slot	Option	Standard 3270 PC		
		Model 2	Model 4	Model 6
1	3270 system adapter	x	x	x
2	64K/256K memory expansion		x	x
3				
4	Display adapter	x	x	x
5	Fixed disk adapter			x
6	Floppy disk drive adapter	x	x	x
7	Printer adapter		x	x
8	Keyboard adapter	x	x	x

Figure 2: A description of the uses of the expansion slots on the IBM 3270 PC Models 2, 4, and 6. Note that slots 7 and 8 are half-size.

ly, using two windows can be helpful. For example, when doing file transfers, they allow you to split the screen and watch what happens on the mainframe as you issue commands in PC-DOS. With more than two windows on the screen, though, the individual windows become too small to use.

The notepads are even less useful than the windows. The idea sounds good, but the actual execution limits their utility. The notepads are little more than blank pieces of electronic paper. If the notepads had the intelligence of even a rudimentary word processor, they might have been a great help. The copying feature is the notepad's most interesting offering. This feature allows you to copy screens of data from a mainframe session or a PC session to a notepad and then to another mainframe session. You cannot copy to a PC session. Once again, however, the feature is rather cumbersome and difficult to use. Software must be constructed around it for it to be of any use. It's easier to make a subset of the required data in SPF edit mode on the mainframe, download it to the PC using the 3270 PC's file transfer capability, and then move it to the final destination. This gets around the notepad's single-screen limitation and returns the data to PC-DOS.

Price

Price is a primary consideration for most prospective purchasers. If you simply want a 3278 terminal, the \$6,000 to \$8,000 3270 PC can't compete with the price of a dedicated terminal (for example, the IBM 3178 costs just \$1,295). The 3270 PC can replace a 3279 color graphics terminal. The host graphics card costs \$800 extra, so you are talking \$7,000 for a minimal graphics system to replace the comparably priced IBM 3279. But, since the IBM 3279 is currently obsolete, if you want IBM host color graphics capability, the 3270 PC is the only game in town.

However, you could achieve the same results with a PC with an add-on board and appropriate software, such as the *FORTE* system. This system would cost \$4,000 to \$5,000 for the PC and an additional \$1,000 for the 3278 emulator board, ending up about \$1,000 to \$2,000 less than a 3270 PC (see Figure 2). In a typical 3270 PC workstation configured for a professional, the total cost for hardware and software would likely end up substantially over \$10,000.

File Transfer

On the positive side, the 3270 PC offers easy file transfer: a SEND command to upload files and a RECEIVE command to download files. This feature does require the appropriate mainframe software. Since IBM maintains mainframe files in EBCDIC (Extended Binary Coded Decimal Interchange Code) rather than ASCII (American Standard Code for Information Interchange), the files must be translated into ASCII and a carriage return/line feed pair added onto the end of each transferred line. The software does this within the command line as illustrated below:

```
SEND C:datafile.tst  
mainfram.data ascii crlf
```

This PC-DOS command sends the PC-DOS file DATAFILE.TST stored on the C: drive to the mainframe, which stores it as a file called MAINFRAM.DATA. The file will be converted from ASCII to EBCDIC, and carriage return/line feed pairs will be stripped from the data. The RECEIVE command reverses the process to download data:

```
RECEIVE C:datafile.tst  
mainfram.data ascii crlf
```

The mainframe software on the other end of the communications link makes file transfer very fast. A file transfer that took 5 hours to complete using an IRMA board

took just a few minutes on the 3270 PC. The file transfer speed is one of the best reasons to get a 3270 PC.

Flexibility Suffers

The 3270 PC stretches the PC's motherboard and system unit to the limit. On a hard disk unit, only one open slot exists (see Figure 3), so you must choose between PC graphics or host graphics. You can't have both. The seven PC expansion slots in use are filled with a 3278 emulator board (distributed function communications adapter), a video controller (display adapter), 256K of extra memory, a hard disk controller, a floppy disk controller, a parallel port (half-size slot), and a keyboard/timer adapter (half-size slot).

The open slot would be used for one of the two graphics boards. The other graphics board would go next to the display adapter, resulting in three boards dedicated to the display. There is no clock/calendar, no place for a modem or serial port, and 512K is the limit with the IBM 256K expansion board. You have to choose between a host graphics (Programmed Symbols Adapter, PSA) card or a PC graphics (All Points Addressable, APA) card.

The only way around this is to purchase an expansion unit at the price of increased cost, noise, heat, and clutter. The advanced /G and /GX models of the 3270 PC (see sidebar, "The 3270 PC's Upscale Relatives") use a "display attachment unit" to provide increased expansion capability.

Incompatibilities

As mentioned above, one of the 3270 PC's most significant drawbacks is its lack of "IBM compatibility." This is true both for hardware and software. For example, Tecmar, Quadram, and AST multifunction boards will not function properly in the 3270 PC. Since the IBM PC Asyn-

Satisfy

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The IBM 3270 PC is actually a mainframe terminal disguised as a PC.

chronous Communication program does not work either, existing modems may not function properly. (Apparently, system timing differences between the PC and the 3270 PC cause much of the incompatibility.) In addition, some boards will function only in specific slots.

Originally, the 3270 PC supported only IBM printers. Even Epson printers wouldn't work! After 3 months, IBM came out with a Control Program patch that cured this problem. The keyboard incompatibilities have already been mentioned. Basically, you need to buy special

versions of standard PC programs, such as *Volkswriter* and *1-2-3*, to ensure that they function properly.

A hard disk adds welcome speed and storage space to a 3270 PC, and it spares you the annoyance and the danger of data loss inherent in maintaining and manipulating floppy disks. Unfortunately, purchasing a 3270 with a hard disk forces you to forego PC graphics in favor of host graphics capability. As a result, a great deal of the PC software will not run on 3270 PCs equipped with a hard disk.

Mainframe Incompatibility

The incompatibilities continue onto the mainframe side as well. While many purchasers buy the 3270 PC to replace a 3279 graphics terminal, the 3270 PC is not a direct replacement. The 3279 is a 32-line terminal, while the 3270 PC (like the rest of the 3278 line) is a 24-line terminal. You do have the option to configure the system in a 24-line graphics mode or in a 32-line graphics mode. Choosing the 32-line mode will allow most mainframe software to work unaltered, but an entire graph won't show on the screen. The system still displays only 24 lines of a graph. You have to scroll the screen to see the rest. This mode of operation is very frustrating, since seeing half a graph at a time is not very useful.

If you choose the 24-line mode, you will discover that your mainframe software may need alterations to allow it to recognize a 24-line terminal and function appropriately. This is the lesser of two evils, however, and should be your default mode.

As mentioned before, the 3270 PC comes with 256K RAM on the motherboard. This is not sufficient to run *1-2-3*. The 3270 PC's upper memory limit is only 512K and requires putting 256K on an expansion board. Most of the memory problem comes because the Control Program is such a memory hog. A typical

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Figure 3: This chart compares costs between a 3270 PC and a similarly equipped PC-XT. All prices are IBM list. Note that neither of these configurations supports host graphics.

system might be configured for one PC session, two notepads, and two host sessions. This minimal configuration results in the permanently resident Control Program taking up almost 200K. Even with 640K installed (if you can find a 384K board that works in the 3270), you may not be able to properly run *Symphony*, *Framework*, or *PC-Focus*.

Bigfoot

The 3270 PC takes up a great deal of room on the desktop. While the system unit is identical to the PC-XT's, the keyboard and the monitor are much larger than their corresponding PC parts. This desk space problem can be solved in various ways. Retractable keyboard holders can be installed under the desktop. This places the keyboard at a more convenient height and also allows a narrower desktop. It also allows you to slide the keyboard out of the way when you're not using it, freeing up valuable space. Also, hard-disk-equipped system units can be mounted on the floor in a vertical position. This also helps reduce noise levels. Finally, the printer can be mounted on a printer stand with the paper tray beneath the printer. Some users opt for a side table beside their desks, for all the paraphernalia. The 3270 PC's big footprint requires you to consider desk placement in advance.

As you have probably gathered by now, the ideal all-purpose professional workstation doesn't exist. The problem with the IBM 3270 PC is that it does not have a true dual personality. It is actually a mainframe terminal disguised as a PC. If your applications require that you interact with a mainframe more than approximately one-third of the time, then you should bite the bullet and get a 3270 PC rather than a PC. If you need to be able to run IBM *GDDM* host graphics, or if you need to do a lot of uploading and downloading of data from your PC to a mainframe, then you definitely need a 3270 PC. If, on the

other hand, your applications require you to interact with a mainframe only occasionally, and your mainframe computing occupies less than one-third of your total computing time, you can probably get by with a PC and a 3278 emulator board. If your applications require PC graphics and access to remote databases, or if you need a flexible and expandable personal computer system, then only a PC will do.

As for specific applications, the 3270 PC won't replace expensive and inflexible dedicated word processors. Even with sophisticated PC word processing software and its 24 function keys, it can't quite do the job.

It does a better job of replacing IBM 3279 terminals and Tektronix and Hewlett-Packard graphics terminals. The ability of the 3270 PC system to emulate IBM

The 3270 PC's Upscale Relatives

Two new enhanced versions of the 3270 PC offer higher-quality graphics—at a higher price.

IBM recently announced two enhanced versions of the 3270 PC, the 3270 PC/G (Personal Computer/ Graphics) and the 3270 PC/GX (Personal Computer/Extended Graphics) workstations. These new models use an operating system called the 3270 PC Graphics Control Program, which provides the same screen-management functions that the 3270 PC Control Program does. The new workstations have been extended to allow manipulation and interaction with mainframe graphics information. In contrast, the 3270 PC acts merely as a dumb terminal restricted to displaying host graphics. The new models add little to the original 3270 PC's capabilities in the PC mode.

The 3270 PC/G configuration includes the IBM 5279 Color Display and the IBM 5278 Display Attachment Unit. The 5279 All Points Addressable (APA) display provides 720 × 512 pixel graphics in eight colors and emulates the IBM Personal Computer Color Graphics Adapter (CGA). The 3270 PC/GX configuration includes an IBM 5379 color or monochrome Display and the IBM 5378 Display Attachment Unit. The 5379

APA Displays provide graphics with up to 1,024 × 1,024 pixels of resolution. The 5378 Display Attachment Unit includes a 32-bit microprocessor for vector, character, and image processing. A new release of *GDDM* (IBM's mainframe graphics software, *Graphical Data Display Manager*), Release 4, provides the host-interactive support for these new workstations. All this does not come cheap. The system units cost \$6,580 each, and a minimal configuration would come to \$11,240 for the 3270 PC/G and \$18,490 for the 3270 PC/GX.

You also have to add in the price of a keyboard, cables, parallel printer interface, extra memory, DOS, Control Program, mouse, and a printer or plotter. A working configuration would thus be in the neighborhood of \$20,000.

The ordinary 3270 PC cannot be upgraded to these newer units, nor can it take advantage of the new *GDDM* release or the Graphics Control Program. The standard 3270 PC is thus being squeezed from below by the PC AT and from above by the /G and /GX models. It will be hard pressed to eke out a viable niche for itself.—E.V.

A 3270 PC based on a PC AT would really be a screamer!

GDDM host graphics is a real plus. The ability to emulate Tektronix terminals, however, depends on emulation software running in PC mode, which requires PC graphics cards.

The 3270 PC does a mixed job of replacing dedicated hard-copy dial-up terminals. To do this, the 3270 PC should have a 132-character screen capability (or the ability to download to a printer in 132-character lines), and modem dial-up capability. The 3270 PC should be able to access the mainframe in both dial-up ASCII and direct connect 3278 modes. It should handle data entry, send telexes to remote sites, dial up outside databases and download information, communicate throughout a corporation, and perform personal computing chores. As the foregoing discussion makes clear, the 3270 PC fulfills some of these roles, but not all of them.

Clearly, the 3270 PC's best features are all on the mainframe side. Its high-resolution alphanumeric color screen, easy-to-use mainframe keyboard, large screen size, and fast file transfer—as well as its ability to run on the mainframe while simultaneously doing personal computing and its ability to see host graphics on the screen in color—make it a useful micro-mainframe link. Unfortunately, the PC side suffers as a consequence. The 3270 PC's worst features include its lack of PC graphics, deficient memory, lack of PC concurrency, keyboard confusion, lack of expandability and flexibility, special software requirements, and general "IBM incompatibility."

These problems are theoretically solvable but would require extensive changes. The ideal 3270 PC needs a new motherboard. If the slots are still limited to eight, the motherboard will have to hold more memory. The new motherboard should come with at least 512K RAM—640K wouldn't be bad. It should also have a built-in clock/calendar, parallel port, and

serial port. This scenario allows all three display boards to fit into units that have been equipped with a hard disk and frees a half-size board for either additional memory or a modem. The availability of the serial port allows the attachment of an external modem or a mouse. The floppy disk controller and hard disk controller boards should be combined and the three display boards boiled down to two at the most. This would free additional space for a local area network. Finally, the 3270 PC's operating system should support concurrent PC sessions as well as concurrent host sessions. And, to shoot for the moon, a faster processor would be nice as well. A 3270 PC based on a PC AT would really be a screamer!

Some of these improvements are in the works, although not from IBM. The recent introduction of third-party memory boards offering a clock/calendar, a serial port, a parallel port, and increased memory capacity (as much as 384K RAM) will help ease the 3270 PC's expansion-slot traffic jam. As of now, however, only AST has shipped such a product. The introduction of 3270-type keyboards for regular PCs will help solve compatibility problems. Such a keyboard is now available with the IRMA board.

However, it's only when IBM recognizes the 3270 PC's deficiencies and repairs them that it will become the all-purpose professional's workstation it should be. As things stand, the IBM 3270 PC is a good first attempt, but its severe limitations make it unsatisfactory for engineers and scientists. It is usable in data processing environments and in business settings where its limited local computing capability won't cause a problem. ■

Edward A. Valenzuela has been involved with computers since 1965, with micros since 1981, and with the PC world since early 1983. He uses an IBM 3270 PC in his work for Dow Chemical.

PC METAMORPHOSIS: 3270 EMULATION

An emulation product will transform the PC into a mainframe terminal—a beneficial link between the IBM mainframe and its family of 3270 peripheral devices.

When you connect a micro to a mainframe, the micro and the host computer maintain their identities to varying degrees, depending on the method you use to make the connection. When you use a database extractor or manipulator, your PC looks and acts in the familiar way. In fact, this setup is similar to using any other PC software, so your machine, for the most part, retains its identity.

Other types of micro-mainframe connections metamorphose your PC. For

instance, when you use 3270 emulation products, your PC essentially becomes a mainframe terminal—a nerve ending from the mainframe brain. This emulation process resembles the way your PC uses an asynchronous connection to establish a communications session with an on-line database, such as The Source. Fortunately, this transformation is reversible, which is why the process is called emulation.

IBM introduced the 3270 family of terminals, printers, and controllers about 12 years ago, starting with the 3278 and 3279 terminals, which, together, are known as the 327x terminals. Then, shortly after the PC arrived on the scene, third-party ven-

The IRMA board is so extensively used that it is a representative example of how 3270 emulation works.

dors began marketing 3270 emulation products to take advantage of this long-standing, popular technology. Big Blue soon followed with its own versions.

IBM has also released the 3270 PC, a Janus-like machine, in which the PC and the 3270 terminal share the same body, as well as unique interface software. The 3270 PC is such a different beast from 3270 emulation on a PC that *PC Magazine* offers a separate article on it (see Edward Valenzuela's article in this issue, "3270 PC: All Thing to All Users?").

The 3270 network, composed of the terminals, printers, and controllers, is the central nervous system of IBM mainframe data processing. If your company uses IBM mainframes, then the 3270 network is the method for linking user terminals to the mainframe systems. Most businesses with IBM mainframes have a network consisting of several hundred terminals and printers. But some larger users have a network with tens of thousands of 3270 devices.

The IRMA Board

Before a PC can join a 3270 network, it must be made to emulate a 3270 terminal. One of the most popular ways to do this is with an emulation card, such as IRMA from Digital Communications Associates. The IRMA board is so extensively used, as both a single product and as a component within a number of software products, that it is a representative example of how 3270 emulation works.

The installation and setup of the IRMA board is a three-step process. Initially, the systems programming and telecommunications groups from the data processing department must, among other things, generate a new system, or "sysgen," of the 3270 network, in which your PC cum 3270 is described as a participating terminal. Your company may use security software on the mainframe, which means your terminal must be authorized to run mainframe applications programs, and you will be assigned a logon ID and a password.

Next, the hardware card must be installed, and the coaxial cable must be connected between the PC and a 3274 control unit, which supervises the message flow between a group of terminals and the mainframe. The IRMA board, or emulation hardware card, is installed in a PC expansion slot. A coaxial cable attaches the IRMA board to a 3274 control unit (see Figure 1). When power is applied to the IRMA board, it immediately begins to communicate with the 3274 control unit. This activity is independent of whatever application may be running in the PC. To make the PC act as a terminal, you must run an emulation program. The emulation software acts as a bridge from DOS to the emulation hardware card, reconfiguring the keyboard to support the keys found on 327x terminals.

When you press a key, the PC translates it into a BIOS key code that is processed by DOS. If the PC is in the 3270 terminal emulation mode, the emulation software further translates the BIOS key code into the 327x terminal key position and scan code. This data is sent to the IRMA board by the emulation software. The IRMA board then transmits the key position and scan code to the 3274 control unit to be processed. The 3274 updates IRMA's screen buffer, and the result is displayed on the screen. This process is repeated every time you press a key. The

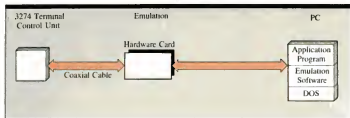


Figure 1: A diagram of 3270 terminal emulation.

IRMA board fools the 3274 into thinking your PC is a 327x terminal. It can do this because it has its own microprocessor and memory that function independently of the PC. In the third step, you customize the emulation program. A menu-driven customization program comes with the IRMA board. Each menu gives you a set of choices that lets you describe exactly what kind of 327x terminal and keyboard should be emulated. Once configured, the emulation program and the IRMA board are ready to be put into service.

The Emulation Program

The emulation program is started in the same manner as any other PC application. You can put the emulation program on your hard disk, if you have one—this allows other PC applications to run at the same time. The PC can now operate in one of two modes: regular PC mode or terminal emulation mode. You switch back and forth between these modes by pressing a "hot key." If the PC is in the 3270 mode, the display contains the data sent from the mainframe computer. The 25th line displays status information similar, but not identical, to that displayed on a 327x terminal (the PC does not have all the special symbols that would appear on the status line of a 327x terminal). Press the "hot key," and the PC will switch to PC mode and display the contents of the screen from whatever PC applications program that happens to be active. Remember, the 327x terminal memory is located in the IRMA board, which is separate from the normal DOS video memory. This allows you to "hot key" between terminal and PC mode without losing the screen data from either session.

It is interesting to note that the 3274 control unit will not send data to the mainframe computer until you press the Enter key or a program function key. The mainframe is different from the micro in this respect: Micro programs can scan the key-

IBM's Central Nervous System

Here's how the 3270 network—comprised of terminals, printers, and controllers—works.

When a PC emulates a 3270 terminal, it becomes a member of the 3270 network, linking together an IBM mainframe and a family of peripheral devices. And within this network constraint, you can configure IBM mainframe hardware and software in many ways. In any configuration, the mainframe computer uses an operating system, just as the PC uses PC-DOS. The operating system here (see Figure A) is Multiple Virtual Storage (MVS).

The Virtual Telecommunications Access Method (VTAM) handles the flow of data between applications programs running in the mainframe computer and the 3270 network. VTAM communicates data to the 3705, which is also a computer. The 3705 in Figure A runs the Network Control Program. The NCP manages the orderly transfer of data between itself and all of the remote 327x devices. The data is transferred using one of the two low-level protocols, bisync or Synchronous Data Link Control (SDLC). SDLC is a part of Systems Net-

work Architecture (SNA), which, in the IBM world, is the framework by which all machines talk to each other. The protocol defines a common "envelope" for transmitting messages on the 3270 network. In this way, one communications line can service many different types of devices.

The 3705, in turn, is linked, via telecommunications lines, to terminal control units. Figure A shows a 3274 terminal control unit with a terminal and a printer attached; the maximum is a total of 32 such devices on a 3274. The control unit acts like a funnel, concentrating messages from a number of terminals down one communications line to the 3705 and ultimately to the mainframe computer. For locations that require only a few terminals, the 3276 terminal would be used because it combines the function of a control unit and a terminal in one box. The object of all intervening hardware is to isolate—as much as possible—the busy mainframe computer from such trivial tasks as deleting a character. —J.S.

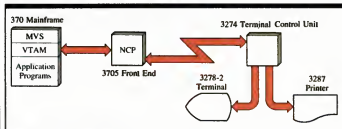


Figure A: Here's a diagram of IBM's 3270 network.

board and take action for every key pressed, but an IBM mainframe program can only read data one screen at a time. For this reason, the 3274 control unit is given enough smarts to perform simple editing tasks, such as inserting and deleting characters or clearing entire lines from the screen.

Achieving Emulation

Although I have used IRMA as the example, IBM and a number of other third-party vendors offer equivalent solutions. The first step in choosing the proper product is determining the hardware environment with which you are dealing. If you are connecting a PC to a terminal control unit, either a 3274 or 3276, then the IBM 3278/79 Emulation Adapter or its equivalent (IRMA) is appropriate. If there is no control unit present, then the emulation hardware card will have to perform the functions of both the 327x terminal and the 3274/6 control unit. The IBM solution is the SDLC adapter; IRMA provides IRMAcom. These products attach the PC to a modem, which communicates to the mainframe.

Another function worth considering is 3287 printer support. Most emulation hardware/software packages allow the IBM graphics printer to emulate the 3287. This fact is important if your mainframe system sends both terminal and printer data to you. Finally, if you use IBM's PC Network, you can still have host communications. A PC can have the PC Network adapter and the SDLC adapter,

providing access to both networks.

With vanilla 3270 emulation, the host system sees only another 327x terminal and has no idea that a PC is at the other end. It takes software at both ends to make the mainframe and the PC aware of each other's existence. This software can pass data back and forth in a manner that expands the capabilities of the mainframe and the micro.

File transfer provides additional advantages—the mainframe disk drives can now expand the storage capabilities of the PC. Also, remote offices can use file transfer to share PC files. The software on the PC, as shown in Figure 2, will prompt you for the direction of the transfer, the source filename, and the target filename. If you want to upload to the mainframe, the PC program will read enough of the file from the PC disk to fill the 327x screen buffer in the emulation hardware card. The mainframe program will then read this screen-full of data and store it on a mainframe disk, known in IBM nomenclature as a DASD, or Direct Access Storage Device. This process is repeated until the entire file is transferred.

File transfers are fine for small flat files; however, large files can take some time. Remember, your PC is emulating a terminal and can only send or receive data one screen at a time. The speed of the data transfer is dependent on the communications line speed, the mainframe response time, and the efficiency of the file transfer programs (both micro and mainframe). A virtual diskette system (see sidebar, "Virtual Power for the PC") is a more elegant solution to transferring files between mainframe and micros.

Finally, database extraction systems allow you to selectively extract data from the mainframe production databases and download that data to the PC.

The good news is that 3270 emulation is the beginning point for a wealth of added functionality for the PC user. The three

Most emulation hardware/software packages allow the IBM graphics printer to emulate the 3287.

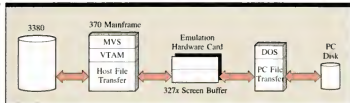


Figure 2: An example of a micro-mainframe file transfer.

Virtual Power for the PC

Virtual disks allow you to transform mainframe files to micro files, share files, and consolidate data from remote offices to a central mainframe site.

The recent addition of virtual disk technology to the arsenal of micro-mainframe links provides the PC with added power and functionality in the corporate environment. In fact, *Tempus-Link*, a package of PC and mainframe software from Micro Tempus, Inc., gives added virtual disk drives to the PC. The term *virtual* is used a lot in mainframe data processing; it refers to the implementation of one type of hardware using another kind of hardware or software. *Tempus-Link* creates PC disk drives by using a combination of PC device driver software, mainframe software, and mainframe disk drives. To accomplish the micro-mainframe connection, you must provide a 3270 emulation product, such as DCA's IRMA board. The mainframe communication is supported by an interactive teleprocessing monitor, such as TSO or CMS.

Conceptually, *Tempus-Link* allows you to create "boxes" of disks on the mainframe. Each box can contain up to

255 disks, with each disk ranging in size from 32K to 15 MB. A VSAM KSDS (Virtual Sequential Access Method/Keyed Sequential Data Set) file on the mainframe is used to store the logical box of disks. On a PC-XT, you have floppy drive A: and hard disk drive C:. With *Tempus-Link* installed, you get access to logical disk drives D:, E:, F:, and G:. Any PC program, including the DOS commands, can access and manipulate files stored on the four logical disks.

Setting up *Tempus-Link* involves both the central data processing department and the PC user. The data processing department must first install the *Tempus-Link* programs on the host. Next, VSAM files must be defined and formatted for each box of logical disks. Four levels of passwords are defined to provide data security. A special VSAM file is set up to manage the sharing of disks among multiple PC users. At the PC end, you must change the CONFIG.SYS file to add the *Tempus-Link* device driver and copy the device driver program to the boot disk. Once these changes have been made, you can boot your PC and try out your new virtual disk drives.

I tried *Tempus-Link* using a PC-XT with an IRMA board that is coaxially attached to a 3274. I initially set up a VSAM KSDS to hold my box of disks and then installed the PC software according to the instructions in the manual. Incidentally, the operating manual was quite adequate; it was divided into

two sections: one for the systems programmers and one for the PC user. To start the *Tempus-Link* session, which requires several steps, I put the PC into 3278 emulation mode and logged on to TSO, and then I booted up the mainframe *Tempus-Link*. After switching back to the PC, I started the *Tempus-Link* interrupt handler. While this process may seem like a lot of work, you are only required to do it once for each operating session.

Tempus-Link provides several commands for managing the virtual disk environment. Each command is a separate PC program that is invoked from the DOS prompt. Two commands are used to manipulate the logical disks: TLID allows you to acquire a box of disks (similar to physically grabbing a box of disks) and TLUSE places a logical disk into one of the logical disk drives. After issuing these two commands, I was ready to get to work. First, I changed the default drive by entering "D:". Next, I entered a DIR command, and to my surprise, I heard a disk drive start spinning. Yes, the *Tempus-Link* PC program actually causes the PC speaker to growl just like a real floppy disk drive. After using *Tempus-Link* for awhile, I realized that the sound effects were quite useful; nothing is worse than a PC program that just sits and gives no visual or audible signs that it is running.

To test the logical drives, I tried several DOS commands; DIR, COPY,

(continued)



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Tempus-Link
lets you create
boxes of disks on
the mainframe.

(Virtual Power for the PC continued)

TYPE, ERASE, and so forth, performed as expected. After copying some text files from physical drive C: to logical drive D:, I wanted to test some application programs. I used Rogue River's SPF/PC program editor for further testing. Using SPF/PC's file utilities, I listed the directory of drive D:, and then I switched to the editor and loaded a text file from drive D:. The speed of file access wasn't fantastic, but considering what *Tempus-Link* was going through, I wasn't disappointed. The amazing thing about the virtual disk drives is that they are completely transparent to the PC user. In other words, if a PC program allows you to specify which drive a file is located on, then that program can use the *Tempus-Link* virtual disks.

Tempus-Link provides enough security and data integrity features to placate any data processing manager. Similar to the write-protect tab on disks, virtual disks can be assigned write/protect or read/write status. Also, to provide data integrity between PC users and mainframe batch programs, virtual disks can be assigned a status of batch-update or batch-lock. This arrangement prevents you from mistakenly accessing the same file as a mainframe batch program. Security is implemented with a combination of passwords and disk-security attri-

butes. A disk can be defined as public, secure, or private. Depending on which password you use, you are defined as owner, secure user, associate, or guest. For example, an owner has read/write privileges for all disks, whereas a guest has read-only access to only the public disks.

To find other uses for virtual disks, I placed a call to Bob Barnes, vice-president for Innovative Computer Products, a distributor of *Tempus-Link*. Barnes cites the data re-entry problem and integration between remote offices as two problem areas in mainframe computing. "The virtual disk lets a mainframe program place production data in a place where a PC user can get to it; there's no need to rekey the data." He also noted that virtual disk files on the host can be shared among many PC users. "For instance, a 1-2-3 user on the West Coast can build a new spreadsheet, and the East Coast office can have immediate access to it."

In general, Barnes gives three reasons for using a virtual disk: "The ability to transform mainframe files to micro files; the ability to share files among a number of PCs, as in networking; and the ability to consolidate data from a number of remote offices to the central mainframe site."—J.S.

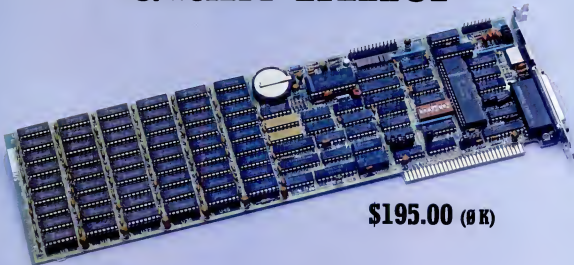
major benefits of linking PCs to mainframe systems are workstation integration, storage and sharing of data files, and access to mainframe databases.

Many people believe that using PCs will reduce the processing requirements of your mainframe computer, but decentralizing processing power can actually increase the processing requirements of the host mainframe computers. With an intelligent workstation, you perform more

work, and that work involves accessing mainframe data. As far as IBM is concerned, the PC may make good gravy, but the mainframe computer is still the main course. ■

John Singer works in database administration for the Regional Justice Information Service in St. Louis. He is currently evaluating the use of personal computers in the mainframe environment.

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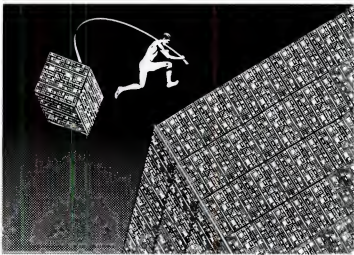
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BASF

THE FUTURE OF THE CONNECTION

The micro-to-mainframe link is far from a perfect marriage, but future database manipulation packages will offer a simpler means to an intelligent connection.



Implementing a micro-mainframe connection is never as simple as "plugging this into that." You need to acquaint yourself with the different communications protocols and carefully distinguish your application from the method of data communication that you choose. In short, you need to become an expert.

The truth is, however, that the great majority of people who need access to mainframe data don't want to concern themselves with the workings of computer-to-computer communications. Middle- to upper-management employees need precise, timely information—data that is crucial to the operation of a business. They need a simple solution, and now there is one: a class of micro-mainframe link products that strives to integrate database management on the two machines.

These products work in conjunction with database software on the mainframe, allowing the output or certain portions of those databases to be downloaded to the PC and then manipulated or worked with at that level. These software packages allow you to tell them, in effect, "give me the information I need" rather than give such specific instructions as, "call the mainframe, sign on, switch to the proper directory, open the data file, extract the appropriate record, put it into a file, translate the file to PC format, send it to the PC, close the file, and sign off." One advantage of such database manipulator packages is that they return the responsibility for data security to the company's manager of data processing.

Database manipulation packages integrate the functions of a mainframe database product and the communication capabilities of a microcomputer. The key phrase used in describing these products is micro-mainframe link, rather than micro-mainframe communication, because the connection between the two computers is

more operational rather than physical. These packages are designed to allow the use of data, rather than its communication.

Most of them use generally available mainframe communications packages, such as Digital Communications Associates's 3270 terminal emulator, IRMA, but one has its own asynchronous communications package built in. The communications program is extremely important because a good match must be made between the mainframe's abilities and the micro's limitations. For this reason, communications packages that emulate IBM mainframe terminals in the 3270 series work best with IBM mainframes.

I looked at four database manipulation software packages for this article: *FOCTALK* from Information Builders, Inc., *EXPRESS-mate/link* from Management Decision Systems, Inc., the *Answer* series from Informatics, and *iLINK* from Info-Center Software. The differences between these packages are not in their functions but in their implementation. I looked at their functions but did not conduct extensive testing.

FOCTALK

FOCTALK is a product of Information Builders, Inc., creators of the popular mainframe database product *FOCUS*. IBI recently introduced a PC version of *FOCUS*, called *PC-FOCUS*, which uses the same commands and syntax as the mainframe version. *FOCTALK* essentially serves as an interface between the two packages, although Information Builders is quick to point out that *FOCTALK* can transfer any files from mainframe to micro, not just *FOCUS* files. *FOCTALK* has four integrated sections. The first is *TableTalk*, which is IBI's custom-designed user interface software. In essence, *TableTalk* presents you with individual menus that contain choices available when formulating a database query. IBI claims that since only valid choices

Database manipulation packages integrate the functions of a mainframe database with the micro's communications capabilities.

will be presented, it is impossible to create an illegal request. The second section is known as LINK, which manages the communications function. It is responsible for building the proper commands to sign on and off from the mainframe, transfer the data, and interface with the appropriate communications facility, usually IRMA. The third module is FileTalk, which is

tions, a mainframe- and a micro-based component. The mainframe part takes the output of whatever database product you are using and transforms it into a downloadable file. Once that file has been transferred to the PC, the micro-based component "unpacks" and transforms it into the appropriate micro-based file format, such as .DIF for VisiCalc files or .WKS for 1-2-3 files. You can choose any communications facility, but the most common is the IRMA board.

EXPRESS-mate/link

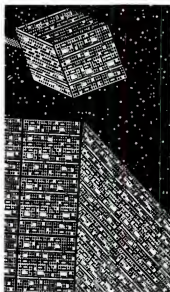
EXPRESS-mate/link from Management Decision Systems, Inc., is the only one of the four packages to have its own communications facility, and it is asynchronous. (MDS is developing a link to IRMA.) The PC portion of this package is little more than an asynchronous communications terminal emulator, but its many menu-driven options allow you to build queries for MDS's mainframe package, *EXPRESS*. The bulk of the processing for this package is handled by the mainframe, after which the data is actually transferred to the PC via the *Xmodem* protocol. The mainframe *EXPRESS* package contains the necessary logic to create PC files readable by 1-2-3, *dBASE II*, *Symphony*, *Framework*, and others.

Answer

The *Answer* series from Informatics General Corporation is three slightly different pieces of software. It was created to accommodate Informatics's mainframe customers who wanted to use personal computers for database operations. You can use it with a wide variety of mainframe packages, but you need a separate PC version to work with files from these three major PC packages: *Lotus/Answer* for Lotus's 1-2-3, *Visi/Answer* for VisiCalc, and *dBASE/Answer* for *dBASE II*. Again, the preferred communications packages are IRMA or FORTE, although simple

asynchronous communication is available as well. The *Answer* packages are notable for their consistent user interface, which is similar to the menu selections found in 1-2-3.

With all four database manipulators, a mainframe session would be similar. After starting up your communication package, you sign on to the host system through a standard logon sequence. Once connected, you enter a query to the mainframe database product, such as "Give me all the records that contain salaries greater than \$25,000". The mainframe then performs this function, returning the results to a special file. This file is in a format that can be transferred readily to your PC, the next



used to create data definitions on the PC where none exist on the mainframe, presumably for transferring non-*FOCUS* data. The fourth module is a text editor called TED, which is designed to emulate IBM's *CMS XEDIT* program.

iLINK

iLINK, from InfoCenter Software, was not, like *FOCTALK*, designed for particular mainframe software. In fact, its creators provide what they call "bridges" to most major database packages, including *SAS*, *RAMIS*, *FOCUS*, *ADRS*, *APLDI*, and *EPS*. The product has two major por-



FOCTALK

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iLINK

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TEAR AND COMPARE

The major problem with most of these products is that they operate in what is essentially an off-line or batch mode.

step. Once the special file has been physically communicated, the package converts the data into a form that is readily usable by 1-2-3 (.WKS format), *VisiCalc* (.DIF format) or *dBASEIII* (.DBF format). These are the predominantly available formats, although most of the manufacturers will customize their packages to some special format (at an additional cost, of course). Bear in mind that the mainframe software does not necessarily require the data to be in some special format; many of the packages can operate on unstructured, or "flat" data files.

It's Not Easy

If all this sounds awkward or laborious, that's because it usually is. The major problem with most of these products is that they operate in what is essentially an off-line or batch mode. The database queries are built on the PC, loaded into a job file, then transmitted to the mainframe. (You may enter a query directly to the mainframe, but you then sacrifice the menu prompts that make these packages easy to use.) The host then takes that query, performs the actual processing, and places the results into the "special" file for later transmission back to the PC. Because each of these steps is a separate, distinct operation, the interaction between you and the data you need is confusing. Even though these software manufacturers have made an effort to ensure these packages are fairly simple to use, there still are problems for an inexperienced operator. *Informatix's Answer* series use a 1-2-3-type format to prompt the operator through the complex menu selections necessary to build a query. *EXPRESS-mate/link's* colorful menus give you a helping hand. *FOCTALK's* "TALK technology" lets you build a query by selecting field names from cleanly formatted tables. But unless you have mainframe database experience, none of these packages is going to be easy enough for you to use.

Another important factor to consider is that most of their manufacturers are usually management or data processing consulting firms, not the typical PC software firms that write for the average user. So, if you already are using *FOCUS* on your mainframe, *FOCTALK* and its accompanying product, *PC-FOCUS*, would probably be a good match for your data processing needs. But if you usually buy your software off the shelf at your local Computerland, you probably lack the resources and know-how to use one of these packages effectively. In addition, the prices are high. The least expensive costs about \$4,500 and the most expensive about \$50,000. These prices include both the mainframe and the microcomputer components, both of which are necessary for system operation.

It's little wonder that the major customers for these packages come from the ranks of the Fortune 1000 corporations. To sell to customers in that league, a company must have more than a good product. It must have a strong marketing and after-sales support staff and a balance sheet indicating that it will still be around when changes and modifications to the packages are necessary. Happily, all the companies producing these products easily measure up to these criteria.

These database manipulators are a long way from being the perfect micro-mainframe link. Until that step is taken, these are probably the best answer to a data processing manager's problems of PC-to-mainframe communication.

Database manipulators bring us much closer to the mythical micro-to-mainframe link that people are searching for. In spite of the limitations in current products, this type of micro-to-mainframe link is comparatively simple to use because it requires less user expertise than other methods and enables us to reap greater returns. Indeed, database manipulators and extractors represent the future of the connection. ■

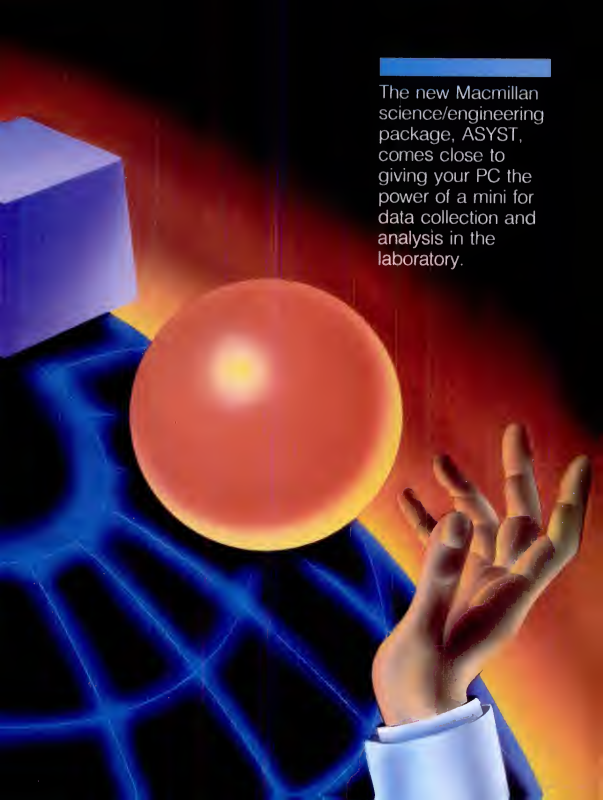


SOFTWARE • PAUL F. HULTQUIST

MINI POWER FOR THE PC

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A hand in a white sleeve reaches up towards a large, glowing orange sphere with a bright yellow center. The sphere sits on a blue, grid-like surface that resembles a circuit board. In the upper left, a white cube is partially visible. The background is a dark gradient of orange and red. A solid blue horizontal bar is positioned above the text.

The new Macmillan science/engineering package, ASYST, comes close to giving your PC the power of a mini for data collection and analysis in the laboratory.

Scientists and engineers have long sortied at using the PC for data collection and analysis because complicated scientific tasks have been beyond its speed and power. But now, *ASYST*, a sophisticated set of integrated software tools for the PC, offers micro users a degree of speed and precision that was heretofore exclusively the province of laboratory minis and mainframes.

Macmillan Software Company's *ASYST* is the first fully integrated package for the scientist or engineer. It is designed to collect data on a PC from external laboratory equipment and process the data in a variety of ways. Or it can be used to issue analog voltages under program control to operate equipment. *ASYST* comes in three main packages: the *ASYST* language (a close relative of Fortran) and graphics package, an elaborate data analysis and scientific computing package, and a package of support facilities to permit easy control of analog-to-digital and digital-to-analog plug-in cards. The *ASYST* language includes many very powerful "words," or instructions, equivalent to whole programs in most other languages. In certain respects, it resembles APL because it allows operations on whole arrays. In other respects, it resembles a Hewlett-Packard calculator because of its stack orientation and reverse Polish notation; however, the operands are more than just numbers in the *ASYST* language; they can also be arrays placed on the stack.

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ASYST runs on a PC or XT; there may be problems with an AT because of hardware differences (see Ed. note, p. 197). The package requires 320K RAM but works better with more memory. For instance, one of the demonstration programs flashed an "Out of memory" message and would not run. *ASYST* also requires the 8087 chip, plus a color graphics card with a graphics monitor. To save the displays, you'll need a dot matrix printer with graphics capability to create screen dumps. *ASYST* supports the Hewlett-Packard 7470 and 7475 plotters. It is also helpful to have at least a B.S. degree in electrical engineering or in a hard science with lots of math. This is not a package for the average computer user.

The ASYST Language

The *ASYST* language is different—to say the least. It consists of "words," which are instructions that range from very primitive mathematical operations, such as addition, to operations on arrays. You can define new words from existing words and then add them to the language. In this sense, words are like procedures or subroutines in other languages, except that they can be executed from the keyboard if the operands are on the number stack in the proper order. For example, you can type

```
2 3 + . <cr>
```

and obtain 5 as a result. The plus sign (+) is a "word" that adds the top two entries on the number stack. The period (.) is a destructive readout operator that puts the result on the screen. A carriage return (<cr>) tells the computer to perform the line of instructions and display the results. (See Figure 1 for the results of several such words applied to different numbers.) Note: If both operands are in INTEGER mode (typed without decimal points), the operation will be conducted in INTEGER mode, but, if any operand is REAL, the operations will be conducted in REAL mode. Figure 1 also shows the rounding behavior of the integer division.

ASYST has hundreds of these words,

```
OK 2 3 + . 5
OK 2.0 3 + . 5.0000
OK 2 PI * . 6.2832
OK 1 3 / . 0
OK 2 3 / . 1
OK 2. 3 / . .6667
OK
```

Figure 1: Integer and real-number arithmetic with *Asyst*. Reverse Polish notation is used to enter numbers and operators with a space as the delimiter. The period at the end of each line clears the stack when the result is displayed. Integer arithmetic rounds to the nearest whole number.

and you can ask for a list of them. These are the primitives of the *ASYST* language, and they range from simple operations, such as +, to such sophisticated operations as XY.AUTO.PLOT, which examines the two top arrays on the stack, scales the axes accordingly, creates the x and y axes on the screen, labels the grid appropriately, and plots y against x.

You are free to add words to the *ASYST* language. Simply put the definition of the new word between a colon and a semicolon. For instance, instead of writing

```
2 3 + . <cr>
```

each time, you can define a word that will add two numbers and display the results. Obviously, this example is not a very profound simplification, but it shows how the *ASYST* language works:

```
: ADD + ? ;
```

The colon and semicolon establish the beginning and the end of the definition, respectively. What you enter after the colon is the name of the word. The *ASYST* basic language words come next. The question mark causes the result to be displayed without removing it from the stack. The definition assumes that operands are on the stack in proper order. Figure 2 shows the operation of the word ADD.

You can make entries to the stack from the keyboard (or any other entry device) in excess of the number of entries required for the operator. The stack entries get "used up" by operators and removed from the stack, but the result is left on the stack as long as "." is not used for display.

A Hybrid Product

The *ASYST* language isn't easy to describe. Its operations are too fast for it to be an interpreter. BASIC would take forever to accomplish some of *ASYST*'s tasks, even if the 8087 were available with BASIC. I believe the best description is in the *ASYST* system tutorial manual:

The *ASYST* system has combined the advantages of a compiler with those of an interpretive language by using something called an "interactive incremental compiler!" [sic] While this phrase may sound like technical jargon, it means that you can "play" with *ASYST*'s capabilities in a manner similar to using interpretive BASIC, but can easily compile new capabilities to achieve the high execution speeds that are generally needed for scientific data acquisition and processing.

The definition of a word with colon and semicolon delimiters causes that word to become compiled and available for use. The invariable use of the stack for operands makes this relatively easy to accomplish. You can permanently create new words and add them to the language by using the SAVE command. Or you can redefine words ad hoc during a session. The compiler issues a warning any time the definition of a word is changed, but its previous definition is saved in the word-definition stack. The FORGET command allows a later version of the word to be forgotten, whereupon the system reverts to the earlier version. The last word created is at the top of the list of words. If a word further down on the list is forgotten, then everything above it on the list is also forgotten; therefore, you are protected from erasing a definition of a word that is used

```
OK : ADD + ? :
ADD name is redefined
```

```
OK 2 3 ADD 5
OK 2 3 5 9 13 ADD 22
OK ADD 27
OK ADD 30
OK ADD 32
OK ADD 37
OK ADD
```

```
Error 89 - binary operations require two entries on the #stack
OK
```

Figure 2: In this example, the new word **ADD** is defined to combine the **+** and the **?** (for "display without clearing the stack") functions. After adding/displaying $2 + 3$, the resulting 5 is left on the stack and then 2, 3, 5, 9, and 13 are entered above it. Successive **ADDs** sum and replace the numbers on the stack until one remains, generating an error message when **ADD** is executed.

```

#####
3Current Stack Contents:  3.1416  ( REAL )  3
3                          3.1416  ( REAL )  3
3Depth: 6                3.1416  ( REAL )  3
                          3  ( DF_INTEGER )  3
#####
OK 3
OK PI
OK DUP
OK DUP
OK

```

Figure 3: The `STACK.DISPLAY` shows the top four items in the stack. The box around the stack contents display would print as straight lines if an IBM had been used instead of an Enson MX-80 printer.

in the definition of another word you created later on in the process.

The top four numbers contained on the number stack can be displayed with the word **STACK.DISPLAY** (see Figure 3 for a typical case). The screen can be changed back to normal mode by typing **NORMAL.DISPLAY**. **ASYS7** also has an array editor. For example, if you have an array called **SQUARE**, then the execution of **SQUARE.ARRAY.EDIT** causes up to 6 columns and up to 15 rows of the array to appear on the screen. You use the Arrow keys on the numeric keypad to move from element to element in the array, and you use the corner keys, such as the Home key, to move to the corners of the array. You can also change the values of the array elements from the keyboard; the element in question is conveniently highlighted in reverse video.

Arrays and variables can be integer, real single-precision, real double-precision, complex single-precision, or complex double-precision. A real, single-precision, 20×20 array, called FUNNY, would be defined as follows:

```
REAL DIM( 20 , 20 ) ARRAY FUNNY
```

Upon its creation, the array is filled with zeros. An interesting operator, called `[]RAMP`, will fill an array with indices. For two-dimensional arrays, `[]RAMP` will fill the rows in order, so the above array would have 1 in the upper left corner and 400 in the lower right corner. Figure 4 shows screen dumps from the array editor after pushing the Home key and then the PgDn key. *ASYS* has, by the way, a very picky syntax. For instance, `DIM[20,20]` will not work; a space must appear on both sides of each number. Likewise, it will not

accept the entry of 3E-5 as a floating point (REAL) number; the number must be entered as 3.E-5 or 3.0E-5.

Operations on arrays are permitted as standard matrix operations and as +, -, *, /, and so forth. For example,

```
REAL DIM[ 100 ] ARRAY FUNNY
<cr>
FUNNY [ ]RAMP <cr>
FUNNY 1 - <cr>
```

will create a linear array called FUNNY of length 100, fill FUNNY with 1,2,3, . . . , 100, and subtract 1 from each element so FUNNY now contains 0,1,2, . . . , 99. FUNNY is left on the stack and can be looked at with the aid of the array editor or by typing a question mark (?). If you type a period (.) instead of ?, you get a destructive readout of the stack contents.

ASYST contains features that allow data collection through analog-to-digital converters. An A/D converter is a device that accepts a voltage input and gives a digital output. The voltages come from transducers of various types, such as a thermocouple, which produces a voltage proportional to temperature. Suppose you wish to build an A/D converter that accepts an input voltage in the range of 0 to 5 volts and produces an 8-bit output, 0 to 255. One way to build it is to connect an operational amplifier so that its output voltage increases linearly from 0 to 5 volts in the time that an 8-bit counter counts from 0 to 255. You then connect the voltage to be converted and the ramp voltage from the operational amplifier to a voltage comparator, which emits a signal at the instant the ramp voltage equals the voltage to be converted. The signal is used to turn off the counter. At the end of the cycle, the counter reading is transferred to an output register, the ramp voltage is reset to 0—as is the counter—and a new cycle is started. Typical conversion rates vary from a low of a few cycles per second up to many thousands of cycles per second. ASYST supports a number of different commercially available A/D and D/A boards but can also be used with a nonstandard ver-

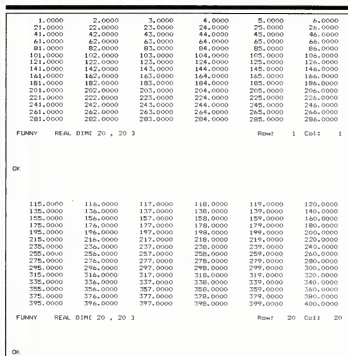


Figure 4: Two screen dumps are needed to print out this 20 x 20 array named FUNNY, which has been filled through use of the incrementing [RAMP operator.

sion, though not as conveniently.

A/D converter boards usually have multiple inputs, or "channels", and different makes and models usually have 8-, 10-, or 12-bit outputs. Typical input voltages are 0 to 5, -2½ to +2½, and so on, and there is usually a provision for adjusting the amplifier gain on the input by jumpers or by software, so that transducer output voltage ranges can be at least roughly matched to the A/D input range. ASYST provides "templates" containing the necessary information for hardware and software to work together. If you wish to shift from using one set of channels to another, you change the name of the template to be used. The template allows for external triggering, external clocking, single or double buffering, and direct mem-

ory access. Direct memory access requires that the array in memory that is to receive the data be within the 64K memory block boundaries. ASYST contains a special array definition for this purpose.

Other utilities in this package include a word called A/D.SCALE. You set up the A/D.SCALE utility by specifying the number of bits in the converter and the physical units range that correspond to 0 and the maximum integer. A/D.SCALE can be applied to the data as it is going into memory or it can be used on data arrays after storage. Using it on input slows down the process. When A/D.SCALE is used on an array, it is necessary for the current template to be the same template that was used in collecting the data.

ASYST provides support facilities for

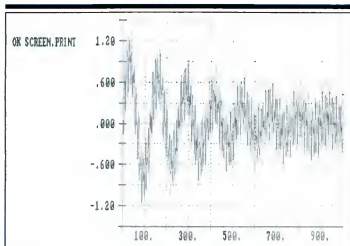


Figure 5: Electrical and D/A conversion noise can often obscure the display of data, as in this 1000-point collection.

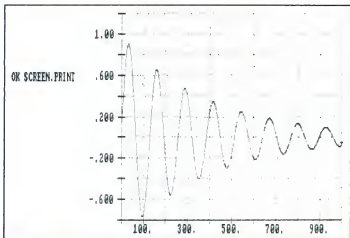


Figure 6: The Asyst SMOOTH filter mathematically processes the signal plus noise to produce clean data from the same 1000-point collection in Figure 5.

D/A conversion that are analogous to those for A/D. Thus, ASYST, plus the IBM PC, can be operated as a sophisticated controller that gathers data about some system, processes the information, and uses it to control the system.

Background/foreground operation, in

which the background tasks are A/D- and D/A-type operations using arrays, is also permitted. (Some A/D and D/A operations use the number stack as a source or destination—that is not allowed here.) The foreground program can be a data analysis or graphics program or about any ASYST

word except the ones used in background A/D or D/A operations. The PC clock is used to interrupt the foreground program, then ASYST consults a user-ordered task table with up to 32 different tasks, to determine which one goes next. TASK.PERIOD lets you set the interrupt rate.

In addition to the extensive facilities for data handling, ASYST contains elaborate mathematical and statistical functions. In addition to the array operations already mentioned, ASYST provides matrix operations of a standard nature: addition and subtraction of vectors and matrixes, dot and cross products of vectors, matrix multiplication, matrix inversion, solution of simultaneous linear equations, and finding eigenvalues and eigenvectors of matrixes. Operations with polynomials include addition, subtraction, multiplication, and division of polynomials, as well as finding roots of polynomial equations through the use of the method of finding the eigenvalues of the companion matrix. The root-finding word is called ESTIMATE.ROOTS, and there is another word, called REFINER.ROOTS, that "polishes" the roots, presumably by Newton's method. Least-squares programs are also available and can be used either with or without weights and with polynomials, the exponential function, and the logarithm. In addition, ASYST provides a procedure for creating orthogonal polynomials for a given data set, so the least-squares polynomial problem is less apt to give numerical trouble because of ill conditioning.

ASYST provides several different routines for smoothing data. Data noise can come from several sources, such as electrical noise that gets into the transducers and "noise" caused by the A/D conversion process itself. In an 8-bit converter, a converted voltage can take on only 256 discrete values (0 to 255), which means that the analog signal usually has a small error by the time it is converted to digital and scaled back to physical units. The simplest smoothing process is to fit a low-degree polynomial to the set of data by a least-squares procedure. The degree of the

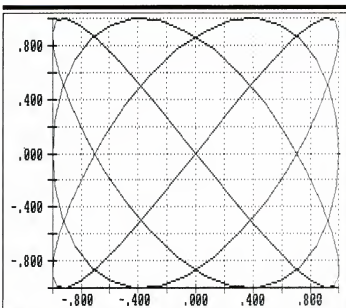


Figure 7: Classical Lissajous figures can be plotted in only about a second, thanks to the speed of the 8087 coprocessor.

CHAPTER 3: Math Glossary

EXP

Syntax

EXP [x -- y]

Returns the base e exponential function of the top number stack entry (i.e. $y = e^{**}(x)$).

Please Note: The EXP function will not operate correctly on complex numbers when preceded by the DEG or GRAD words. The system must be using radians for angular units.

Figure 8: ASYST's glossary entries show the use of its functions clearly but are not extensive enough to take the place of the program's tutorial sections. In this glossary example, the "word" EXP returns the base e exponential function of the top number on the stack (that is, $y = e^{**}(x)$). Incidentally a residual bug was found in this particular function, since it returns accurate answers for complex numbers only when ASYST is using radians, not degrees or grads.

polynomial must be high enough so it can follow the trend of the data but also low enough not to follow the noise.

The extraction of the "signal" from the mixture of "signal" and "noise" is a classic electrical engineering problem. Often a low-pass filter is used because the noise is usually composed of many high frequencies, while the signal is lower in frequency. However, in some cases, you may have already collected data, so you have to get rid of the noise after the fact; or for other reasons it may not be possible to use a filter. ASYST has a couple of powerful tools to use. One is SMOOTH, which does in the frequency domain what an actual filter would do in the time domain. It performs a convolution of the data with weights from a low-pass Blackman window. Figures 5 and 6 show a noisy graph (1000 points) and the same set of data after being SMOOTHed. The computation requires 15 to 20 seconds.

A fast Fourier transform program and an inverse fast Fourier transform program are also included in the mathematics and data analysis routines. These programs are useful in data analysis.

ASYST Documentation

An ASYST demonstration disk provides several programs, such as one that traces out Lissajous figures, one of which is shown in Figure 7. Lissajous figures result from plotting the values of sines or cosines on two axes, with different frequencies for the two functions. It takes only about a second to trace one of the patterns; without the 8087, it takes 10 or 20 seconds. In addition to making ASYST functions run at impressive speeds, the mandatory 8087 makes it possible to offer single- and double-precision versions of mathematical functions. ASYST allows sine, cosine, tangent, secant, cosecant, and cotangent, as well as all of the inverse functions. In addition, all of the hyperbolic functions and their inverses are included, and they can even use complex number arguments. Complex numbers can be displayed and used either in rectangular form, $x + yi$, or

in polar form, $R \exp(i\theta)$.

ASYST's glossary and tutorial manuals are particularly well done. The quality of writing is much better than what I've found in most computer manuals. Mathematical functions are defined carefully and correctly. The examples are well chosen, and the pace was quite satisfactory. None of the manuals in my prerelease version had an index, which was annoying because I had to remember where I had seen each ASYST word if I needed to look it up. Fortunately, Version 1.0 manuals, to be released soon, will have indexes.

The glossary volumes define each of the ASYST words in a uniform manner (see Figure 8 for an example—the glossary's definition of the exponential function word). In Figure 8, the $\{x - y\}$ means that x (the argument) is to be found as the top entry on the number stack and y is placed as the top entry after execution. Some procedures do not have parameters, such as SCREEN.CLEAR; in that case, the notation is $\{-\}$. A few examples are given in the glossary volumes, but nowhere near as many as in the tutorial volumes.

Looping Structures

The ASYST language contains several control words that allow looping and branching. But because of the very powerful words in the language, loops may not be as frequently used in ASYST as in other languages. For instance, RAMP allows you to do with one instruction what would require a loop structure in Pascal, FORTRAN, or BASIC. the DO . . . LOOP instruction works as follows:

```
Max+1 Min DO
<Words to be executed>
LOOP
```

The loop is executed starting with the value of Min and then incrementing by one until Max+1 is reached. If Max+1 is smaller than Min, the loop will be executed once. An exit from the loop is made with the execution of LEAVE, which changes Max+1 to the current value of the index, so that no jump-out is made; loop-



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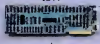
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ASYST

ing is then terminated at the end of the current pass. DO . . . LOOPS can be defined only within colon definitions of words and can be nested to a maximum depth of three. Current values of I, J, and K, the loop indices, may be accessed within the loops. I and K are the indices for the innermost and the outermost loops, respectively. Another form of loop is the DO . . . +LOOP, which can have an increment other than one.

Other looping structures are the BEGIN . . . AGAIN and the BEGIN . . . UNTIL. BEGIN . . . AGAIN, an infinite loop structure, can only be exited if one of the words between BEGIN and AGAIN executes an EXIT, ABORT, or BYE. BEGIN . . . UNTIL repeats until it finds a true value on the symbol stack. BEGIN . . . WHILE . . . REPEAT is a multiple loop structure. At WHILE, there is a test of a true/false condition that must be set by a word in the BEGIN . . . WHILE portion. If the condition is true, the WHILE . . . REPEAT portion of the loop is executed with a return to the word following BEGIN. If the condition at WHILE is found false, control passes to the word following REPEAT. Again, these loops must be used within a colon definition word.

Conditional execution is controlled by an IF . . . THEN. The IF looks for a true/false on the symbol stack, and if it finds the condition true, then the words between IF and THEN are executed. In other words, THEN doesn't mean "then" but is used as a delimiter to signify the end of the words (instructions) to be executed conditionally; it is really an "endif." IF . . . ELSE . . . THEN tests for true/false at the IF position. A "true" causes execution of the words between IF and ELSE, and a "false" causes execution of the words between ELSE and THEN. For either kind of IF, the conditional is removed from the symbol stack after execution. ASYST also has a CASE statement for multiple branching and a word, called MYSELF, that permits recursion when included within a colon definition of a word.

ASYST's graphics facilities are good. A



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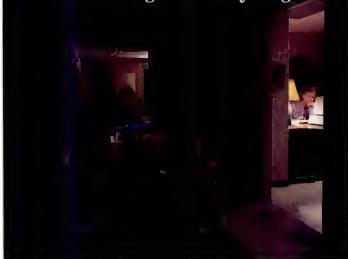
variety of primitive words allows you to create view ports, draw axes, label, and so forth. These graphic capabilities are also incorporated in a couple of very powerful commands. Y.AUTO.PLOT plots any array that is on top of the stack against its indices, with automatic scaling and labeling of the scale on the axes (as was done in Figures 5 and 6). Y.DATA.PLOT allows the graphing of other arrays on the same set of axes, whereas Y.AUTO.PLOT erases the viewport and creates a new set of axes and grid markings. XY.AUTO.PLOT and XY.DATA.PLOT operate in a similar way, except they plot a y array against an x array—a useful capability. When the graphics screen is on, the OK prompt appears on the left. New instructions can be entered and executed in this mode, including SCREEN.PRINT. The limited space to the left of the viewport makes "wraparounds" necessary, so that it's sometimes hard to read the instructions.

ASYST's screen dump to a printer is very slow. It plots by making vertical scans on the screen, so graphs come out turned 90 degrees in a manner similar to IBM's GRAPHICS.COM. It took more than 5 minutes to do the plots I tried.

Conclusion

There is nothing else like ASYST on the market in one integrated package. The capabilities built into ASYST are very impressive, and many of its features are very easy to use. The documentation is some of the very best I have seen. It is a powerful tool for many functions. True, I found the ASYST language itself rather inelegant. Programs written in ASYST are difficult to follow, cryptic—even baffling. But they work, and the ASYST words do powerful things. Thus, I am sure that, despite the need to master a new language, many scientists and engineers will rejoice at having such a versatile tool to turn their PCs into minis. [Ed. note: The version tested by Prof. Hultquist is not quite compatible with the AT and is being updated at no charge. The current 1.01 version is fully AT-compatible.] ■

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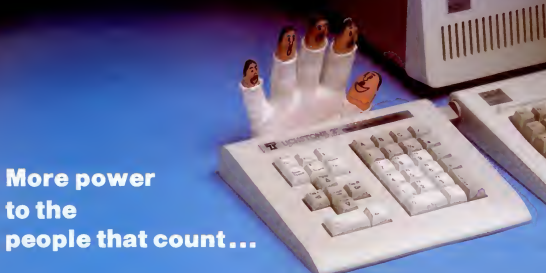
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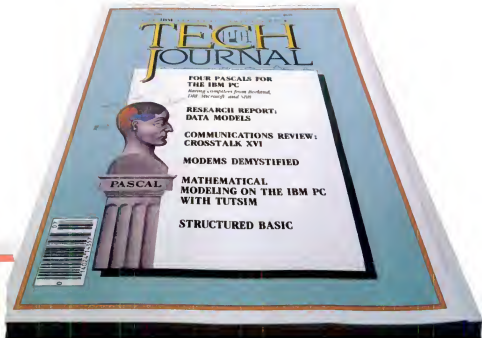


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PCJ2177

Organize Your Desk



Illustration: Darryl Zwick

and Your PC



Four software packages provide everything from an electronic calculator to financial record keeping.

Someday I have to get organized and clean the papers off my desk—I can hardly find the PC keyboard, much less my desk calendar, pen, and phone book. I'm late for a meeting? *What meeting?*

At least the software manufacturers took pity—here are four software packages that promise to help organize my life and PC files. Borland International's *Sidekick* and Software Arts's *Spotlight* provide an electronic calculator, appointment book, telephone directory, and notepad accessible from within most other programs, just a few keystrokes away. *The Integrator* will organize my PC with a menu-driven shell and file translation, plus a built-in calculator, appointment book, and notepad. IMSI's *Bisysbase* keeps records of financial dealings and appointments.

Should I buy one of these software packages, or should I get all four? That would cost, let's see—hey, who borrowed my calculator?

Spotlight

With *Spotlight*, I don't need an old-fashioned calculator. All I have to do is press a few keys, and a calculator will appear on my screen. By using a feature of DOS to remain resident in computer memory after it is initially loaded, *Spotlight's* calculator and other features can be called up to the screen from within most other programs.

If you're doing word processing and want to make a quick calculation, just flip a few keys and a calculator appears on the display. After you're done, flip some

DESK ORGANIZERS

more keys and you're back to word processing. If you're working on a spreadsheet and need to jot down something, you can call up a notepad, take notes, and then return to the spreadsheet.

Although *Spotlight* is relatively inexpensive, it carves out about 75K of memory, so you may have to spring for another 64K or more of memory to accommodate it. Moreover, the utility programs (a calculator, notepad, appointment book, a phone book, an index card system, and a DOS filer) remain on disk until they are called up, and they require a total of more than 100K of disk space.

When first loaded into memory by running the main program, *Spotlight* displays a copyright message, then seems to end. Actually it has done a lot and monitors much of what goes on in your PC. When you hold down the Alt and Shift keys and press a letter (C for calculator, A for appointment book, and so forth), the *Spotlight* utility is called up from disk and displayed on the screen. It's not instantaneous (since a disk access is involved), but

PO

Spotlight

Software Arts, Inc.
27 Mica Lane
Wellesley, MA 02181
(617) 237-4000
List Price: \$149.95

Requires: 75K RAM, DOS 2.0 or above.

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Sidick

Borland International
4113 Scotts Valley Dr.
Scotts Valley, CA 95066
(408) 438-8400

List Price: \$49.95 (copy-protected version); \$29.95 additional for non-copy-protected version.

Requires: DOS 1.1 or above, Hayes Smartmodem or compatible (for dialing facility).

CIRCLE 798 ON READER SERVICE CARD



The *Spotlight* calculator is on the right; the appointment book, on the left.

Spotlight can be speeded up considerably by putting the utility programs on a RAM-disk installed as a DOS 2.0 device driver.

Numbers and Notes

Spotlight's calculator, a simple four-function infix notation implementation, takes up half the screen with a diagram of the PC's numeric keypad and the surrounding keys, each labeled with its function. The Enter key is "equals," for example; the Backspace key is "clear." Memory save and recall are also available.

Calling up the calculator will toggle on the NumLock key, so the numeric keypad can be used immediately for entries. When the calculator is exited, *Spotlight* politely restores the NumLock key to its previous setting. The calculator is easy to use. When you press one of the keys, the corresponding key on the display briefly blinks in reverse video. It's a nice touch.

The *Spotlight* utilities have a similar command structure that lists the available commands on the top of the utility display. For the calculator, they are QUIT and PASTE. After pressing the Esc key, you can execute one of the commands in the much-loved 1-2-3 manner—either move

the reverse video bar to the one you want and hit Enter or just type the first letter.

QUIT will instantly restore the screen display and return you to the program you were running. PASTE will do the same thing but will also transfer the final calculated value to where the cursor was, just as if you had typed it.

Spotlight's notepad is really an eight-page, 14-line-per-page, 39-character-per-line miniature word processor. It has a snappy, dynamic wordwrap, but the pages are distinct, and text can't be moved from one page to another. Operation is easy and instinctive—the cursor, Del, and Backspace keys all work as you would expect.

Although *Spotlight's* notepad is saved to a special disk file, the whole notepad, or single pages, can be saved to a filename of your choice—a good way to make batch files of fewer than 14 lines.

Cards and Directories

Spotlight's telephone directory and index card system are designed in a similar way. Each card in the telephone directory has a name, number, and description. Up to 500 numbers can be stored in each directory, and up to 36 different direc-

ries can be accessed from disk.

Another 36 sets of generalized index cards can also be stored on disk and called up for browsing, searching, and editing.

Spotlight provides three toll-free numbers in its telephone directory, for the American Red Cross, Conservation and Renewable Energy, and the U.S. National Runaway Switchboard. I'm not sure how relevant they are to the average PC owner. I think it's unfortunate, however, that Software Arts didn't have the guts to put its own technical support number in *Spotlight's* telephone directory.

Another of *Spotlight's* utilities displays a monthly calendar and a daily desk-type appointment book. Although you may miss the seasonal art or swimsuit photos that appear on traditional calendars, *Spotlight's* calendars serve quite well, and you don't have to buy a new one every year. Were you just invited to a New Millennium party on Sunday, December 31, 2000? Put it in.

The appointments are saved to a disk file and reloaded the next time you use the utility. For any appointment, an audible alarm can be set to notify you that you're due soon for a meeting. If, however, you're in the habit of catching a few z's in the middle of the working day, the alarm is probably not loud enough to wake you.

Dangerous DOS Filer

Spotlight's DOS filer utility allows several DOS-like functions—formatting disks, changing directories, and viewing, renaming, and deleting files. If not used right, though, this option could cause you trouble; it has at least one bug in it. If you view a subdirectory that is not your current subdirectory, *Spotlight* will change the directory to the one that was viewed. You must change the directory back within *Spotlight* before you leave.

Overall, however, the *Spotlight* system is reliable and easy to use, with clear and straightforward displays. The on-screen help text and the manual are also quite good. *Spotlight* will not work from within programs, such as *XyWrite*, that take over

the hardware-generated keyboard interrupt, and it sometimes interferes with other programs that remain resident in memory. But it has been programmed to be nearly crash-proof. Evidently, Software Arts was able to obtain information on undocumented features of DOS that gave the company a significant advantage in designing the program.

All of the Sidekick utilities can be displayed at once, just as windowed software does. I can pile up windows until my PC screen looks as cluttered as my desk.

Spotlight is copy protected, but an installation program allows it to be copied to a hard disk or another floppy disk. Installation is the most complex part of operating the program. Because the number of installations is limited by the copy-protection scheme, it's risky. A noncopy-protected version would be less nerve-racking.

Sidekick's Challenge

Borland International's *Sidekick* performs about as well as *Spotlight* for a lower price, and it has some notably unique features. *Sidekick* may be a big hit, though it's not as easy to use as *Spotlight* and is sometimes unpredictable. Some *Sidekick* features would be used only by programmers, while *Spotlight* is more attuned to nontechnical and business use.

Sidekick and *Spotlight* also differ in speed. The *Sidekick* program is kept entirely in memory, so the utilities appear instantly on the screen. It also uses up less

memory; the default configuration takes up about 60K instead of 75K. The disk space is an optional 42K for the Help file, and anything else needed for the notepad, telephone directory, and appointment files. The space difference exists because *Sidekick* was programmed in assembly language, while *Spotlight* was coded in C.

After you've loaded the program, you can call up *Sidekick* by pressing the Alt and Ctrl keys simultaneously or both Shift keys. The *Sidekick* main menu appears, and you press a letter key to invoke the desired utility. *Sidekick's* speed makes it impressive to demonstrate and fun to use. Although *Spotlight's* ability to overlap different utilities on top of your regular files is limited by the amount of memory allocated to it, all of the *Sidekick* utilities can be displayed at once, just as windowed software does. I can pile up windows until my PC screen looks as cluttered as my desk.

Using the Alt and Ctrl keys to call up the *Sidekick* menu makes it appear whenever you boot the operating system with the Ctrl-Alt-Del combination, something that always startles me. Unlike *Spotlight*, *Sidekick* will affect other programs—for example, by slowing background printing using the DOS print program or by not accurately restoring the display screen when it leaves. I also had some lock-up problems with *Sidekick*, (it would only emit beeps). You can usually recover by hitting the Enter key, but the manual doesn't discuss this method.

Sidekick's Calculator

Sidekick's calculator, which occupies about one-quarter of the display screen, is smaller than *Spotlight's*, and more cryptic. Many of the special calculator keys use letters (C for Clear, E for Clear Entry).

The *Sidekick* calculator is also four-function with infix notation. It displays 18-digit results but always uses 4 for decimals. One advantage for long calculations is that *Sidekick* supports up to six levels of parentheses.

Sidekick is more versatile than *Spot-*

DESK ORGANIZERS



The Sidekick calculator is on the right; the monthly and daily calendars are shown on the left and center, respectively.



The Integrator calculator—good enough to be sold by itself.

light in transferring numbers to another program and allows any intermediate or final result to be assigned to keys of your choice. The selected keys will then reproduce the assigned numbers when you exit to another program.

For assembly language programmers or BASIC PEEKers and POKEers, Sidekick has a feature that would otherwise

cost \$75 for a special Texas Instruments calculator: It can convert decimal numbers to hexadecimal and binary and back again, and it can do hex and binary operations, including AND, OR, and XOR logic functions.

For programmers, Sidekick also includes a utility that displays all the ASCII codes, their decimal and hexadecimal rep-

resentations, and the associated IBM display graphics on-screen so you can see how they look.

The Sidekick appointment calendar is similar to Spotlight's, but without the alarm.

WordStar-like Notepad

If you use WordStar, Sidekick's notepad will be familiar. It is basically a subset of WordStar's nondocument mode (similar to Borland's Turbo Pascal editor). A carriage return must follow each line, but the notepad has horizontal scrolling for long lines.

If you don't use or like WordStar, you can redefine your keyboard to use other commands.

Because any filename can be assigned for accessing and saving notepads to disk, Sidekick becomes a versatile resident editor that can actually replace WordStar for the creation of program source files and other nondocument files. The memory reserved for editing files is 4K, but an Install program can expand it to 50K and increase the memory residence size by the same amount.

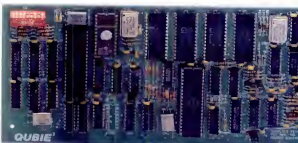
The notepad can also be used for saving a screen display. In a simple, beautiful implementation of WordStar's block copy commands, Sidekick can transport all or any part of the display screen (even an area overlaid by the notepad display) to the notepad. Notepad entries can also be time- and date-stamped, either with a WordStar-like Ctrl-key combination or automatically with a dot command.

Automatic Dialer

Like Spotlight, Sidekick comes with a telephone directory (and it doesn't include the manufacturer's technical support number, either).

But Sidekick will dial a number for you, provided you have a Hayes Smartmodem or compatible. You really don't need a special telephone directory, because the dialer will search the entire screen display for something resembling a telephone number and then wait for con-

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firmation or move on to the next. This means that you can dial any telephone number you can display on your screen (from a database, spreadsheet, word processing text, or the like).

The *Sidekick* dialing program is a particularly neat feature with the Hayes 1200B (internal board) Smartmodem because the built-in speaker will broadcast the call until you hit the space bar. If the sound from the speaker were a little less garbled, you could call and listen to recorded messages and hang up electronically without ever touching your telephone.

The Dark Side of Copy Protection

Now let's air some of Borland's dirty laundry. When you send \$49.95 for *Sidekick*, you receive a copy-protected version. The original disk must be in drive A: or B: for *Sidekick* to load. But *Sidekick* is the type of program that you want loaded every time you boot up, so this is a hassle, particularly with a hard disk. For an additional \$29.95, with a signed license agreement, Borland will send you a copy of *Sidekick* that is not copy protected. To me, this seems like a deceptive way to advertise a \$79.90 product for \$49.95.

Borland has heard many complaints about this and is aware of the problem. As of this writing, the company has plans to specify the higher price for the noncopy-protected version in its advertising.

The Integrator

If you'd like a better calculator and appointment book than *Sidekick* or *Spotlight* offers and will give up accessibility from other programs, check out *The Integrator*. The calculator and calendar are downplayed in *The Integrator*, but they are good enough to stand by themselves.

ModTech International's *Integrator* aims to organize your PC rather than your entire professional life. It's like the United Nations—it brings together disparate parties under one roof and allows them to



In a simple implementation of Wordstar's block copy commands, *Sidekick* transports all or part of the screen to the notepad.

communicate meaningfully.

But this does not come cheap. *The Integrator* Workstation and Tools require about 1/4 of a 10-megabyte hard disk. Unlike the United Nations, *The Integrator* exercises dictatorial control: subdirectories must be named the way it wants; it will change any PATH command you set; the installation will change your DOS prompt; and it reads function keys through DOS instead of BIOS. Unlike most other

programs that use the function keys, *The Integrator* will not work correctly if you've redefined these keys under the DOS 2.0 ANSI.SYS facility.

The programs integrated by *The Integrator* are dBASE II, 1-2-3, MultiMate, Multiplan, PFS:FILE, PFS:GRAPH, SuperCalc 2, VisiCalc, Word Perfect, and WordStar. (I evaluated *The Integrator* on a PC-XT with 1-2-3, VisiCalc, MultiMate, and WordStar.)

The Integrator also comes with four Tools programs, including a calculator, an appointment book, and a notepad. Although the tools do not remain in memory and are therefore not immediately accessible from within another program, you may not mind much after you taste some of their power.

The Integrator gathers the four tools and any or all of the ten programs it supports in a single menu. Move the reverse video bar to the one you want and press the Enter key, and you are then transported to another menu that lists all the files associated with that program. You can enter the program directly or move the cursor to a filename. *The Integrator* loads the program and then supplies the keystrokes to load the specified file into the program. After that, however, the programs work in the familiar way. *The Integrator* will not simultaneously display different programs in windows.

The Integrator acts as a shell to ease and organize your operation of the PC; or you may see it as another obstacle to get around before you can use your programs. But there's more to *The Integrator* than the front end.

Lazy File Conversions

The Integrator can convert data files from any program it uses to a form readable by another program. Parts of these conversions are done by *The Integrator*'s own utilities, and parts are done by the programs it controls—*The Integrator* loads the programs and supplies keystrokes to carry out the conversion.

Without *The Integrator*, for example,

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DESK ORGANIZERS

you could translate a 1-2-3 worksheet into a *MultiMate* file by running 1-2-3, loading a worksheet, printing it to a file, leaving 1-2-3, going into *MultiMate*, running the *MultiMate* utility to convert the print file (in ASCII) to the *MultiMate* format, and then editing the converted file. That's exactly how *The Integrator* does it, but it's all automated. You can sit back and watch your screen as 1-2-3 and then *MultiMate* is run with all the necessary keystrokes provided by *The Integrator*. It ends by leaving you in *MultiMate* edit mode looking at what was once a 1-2-3 worksheet. Pretty slick, right?

Well, not quite. While the 1-2-3-to-*MultiMate* conversion works as expected, the *WordStar*-to-*MultiMate* routines convert the files to ASCII during an intermediate step. Thus, all special print formatting, dot commands, header information, and soft carriage returns are eliminated from the converted file. This is not a true conversion between *WordStar* and *MultiMate*.

Similarly, conversions from 1-2-3 to *VisiCalc* have a DIF file intermediate step—all the formulas are converted to

calculated values. The 1-2-3-to-*VisiCalc* conversion preserves the formulas because it uses 1-2-3's translate routine. Very simply, the 1-2-3 and *VisiCalc* conversions offer nothing beyond what you already

The Integrator aims to organize your PC rather than your life. It's like the United Nations—it brings together disparate parties under one roof and allows them to communicate meaningfully.

have if you use both programs. All *The Integrator* does is execute the keystrokes for you. You can be lazy and sit back and watch, but the real slouch here is *The Integrator*.

The halfhearted conversions remind me of the (probably apocryphal) English/Russian computer translator. When "The spirit is willing, but the flesh is weak" was translated from English to Russian and back again, it came out "The vodka went down easy, but then I got sick."

For conversions from unstructured formats like word processing to structured formats like a spreadsheet or database, *The Integrator* needs your help. It stops halfway through and displays the intermediate result. The chore of cutting up the file and pasting the pieces into neat columns falls to you. *The Integrator* provides a nice collection of spreadsheet-like commands to facilitate the editing. Macros can be defined to cut and paste at the touch of a key, convenient for routinely extracting numerical tables from a text document to work with in a spreadsheet or store in a database.

The Integrator Tools

If you haven't bought any of the software packages that *The Integrator* supports, you can still use four Tools programs provided with it—a calculator, a calendar appointment system, a scratchpad, and a file-archiving system. The tools cannot be run separately but must be accessed through the main workstation.

The file-archiving program backs up hard disk files on diskettes with an index card that contains information you supply about the file. You can then locate archived files based on this information, specifying ranges of values with logical ANDs and ORs.

The calculator doesn't have a number pad displayed on screen or hexadecimal conversions, but it has ten displayed storage registers, a continuous paper-tape-like display, scientific notation, trigonometric, exponential, and logarithmic functions, and programmability. Now that's a calculator, and you can route the paper tape (even the part scrolled off the screen) anywhere you want.

Of course, the calculator should be good because the program takes up almost 100K of disk space. The calendar is also well implemented. The display includes both an appointment calendar for the day and a calendar for the current month. You can add details to any appointment, such as a note reminding you to wear a particular tie that has proved its powers before. An alarm can be set that emits a short chirping sound (almost enough to wake you from a nap) and displays the appointment at the bottom of the screen, even if you've left *The Integrator*.

ModTech tells me that the calculator and calendar have received such high praise from users that the company is considering selling them separately.

The scratchpad, however, is an exception. It doesn't have wordwrap and beeps when you reach the right margin.

The Integrator was once called "Lois" (for Lytron Office Integration Software). The manual and programs I evaluated were all identified as such. I'm shocked



The Integrator

ModTech International
656 Bair Island Rd., #302
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(415) 367-6855
List Price: \$395

Requires: 128K RAM, DOS 2.0 or above, PC-XT (or PC with a hard disk).
CIRCLE 799 ON READER SERVICE CARD

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Requires: 64K RAM, DOS 1.1 or above.
CIRCLE 800 ON READER SERVICE CARD

that the Lois help screens included the sentence "A remind entry is like a nagging wife." C'mon—at least use the word "spouse."

Back to Earth

Bisibase from IMSI is a financial record-keeping and scheduling system for both individuals and small businesses. It is bulky, dull, slow, uninspired, and has a silly name.

Despite the artwork on the front cover of the manual, *Bisibase* doesn't display information on simulated index cards or desk calendars. The calculator keys on the manual's cover imply that *Bisibase* has a calculator; it doesn't. Nor will *Bisibase* remind you of appointments (as the back cover of the manual promises). Though *Bisibase* can be useful for some record keeping, it cannot live up to the hype on the package.

Designed for CP/M systems, *Bisibase* has been lamely adapted for the IBM PC, with few changes for the PC version. No changes have been made to the CP/M-oriented manual.

For example, when *Bisibase* is first loaded, it asks for the date, which is annoying because you already told the PC the date when you booted up. But *Bisibase* needs its own date, which it saves in its configuration file, so when *Bisibase* is loaded the next time, it knows the date (or rather, the date that it was last used). The date requirement, though useful for CP/M systems, could easily have been removed for the PC version.

Users accustomed to the speed of PC-specific programs that remain wholly in memory will get a taste of what it was like to run big programs in the bad old days of CP/M. PC-DOS users will choke on the numerous disk accesses required for *Bisibase* to use its 14 overlay files, 4 data files, and 6 internal files associated with the data files. The entire *Bisibase* system is menu driven, but most times you make a menu selection, the disks whir as *Bisibase* carries out your request. A common *Bisibase* message is—you guessed it—

The screenshot shows a text-based interface for entering or modifying a record. At the top, it says "Enter or Modify a Record". Below this, there are several lines of text representing form fields. Some fields are filled with data, while others are empty. The data includes a name "Mr. J. J. Jones", an address "1234 Main St.", a city "Anytown", a state "CA", and a zip code "94310". There are also fields for "Phone", "Balance", "Credit Limit", and "Account Balance". The "Balance" field shows a value of "100.00". The "Credit Limit" field shows "500.00". The "Account Balance" field shows "75.00". At the bottom, there is a line of text that reads "Type a background of financial data, or 2018187: 2".

The *Bisibase* entry screen for background and financial information.

"Busy."

IMSI told me that about 90 percent of *Bisibase* sales are for the IBM PC version, so it will revise the program to make it faster, less disk-oriented, and more PC-specific.

Background and Financial Records

At the core of *Bisibase's* data management are files containing background and current financial information for each individual or business that you deal with. Display screens are provided to add, change, delete, and view these records. The background information includes an address, phone number, and contact information. The financial information shows your financial status with the individual or business.

Using this information, *Bisibase* can create mailing labels in three different formats, an address book, and a mailmerge file for use with a word processor. Five word processors are supported—*WordStar*, *Select*, *Perfect Writer*, *Spellbinder*, and *Peachtree's PeachText*—except that *Perfect Writer* is not implemented in this version. Besides *WordStar*, *Bisibase* doesn't support the more popular word

processing packages for the PC.

The mailing labels, address listing, and mailmerge file can be limited by specifying an upper and lower range for any combination of fields that exist on the individual background and financial records. You could limit mailings to your California customers, for example, to those who don't owe you money, or to company contacts whose last names begin with the letters K, L, or M. The selection criteria can be saved as a file or printed.

It adds together the amounts that you owe creditors as well as how much your customers owe you. A summary can be printed so that you can tell how your finances balance out. This can be done in 18 different currencies, provided you've entered the exchange rates.

Another series of menus is reserved for recording financial transactions with your clients. The financial information on the main records is updated when a transaction is entered.

You can get a printout of all the financial transactions that you have entered. The menus in *Bisibase* refer to this listing as an audit trail, but the "Payments Journal" label on the printout is more accurate. This listing simply shows the

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So for an office system that truly offers room to grow, choose ISI International's 5160 office system.

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The ISI 6160 is essentially the same easily expandable processor as the 5160, featuring the same PC and XT-compatibility, but with important additional features that make this the ideal system for factory applications.

For example, it's 19" rack-mountable RETMA enclosure is ruggedly designed and manufactured, and features fan cooling with positive airflow to eliminate hot spots; changeable filters for extra protection from contamination; and a key-lockable cover for limited access to power and reset switches, as well as to the shock-mounted disk drives.

Both the 5160 and the 6160 offer MS-DOS* and GW-Basic;* in addition, the 6160 factory system offers VRTX†, a multitasking kernel that permits you to run real-time, interrupt-driven control applications.

For operation in a more office-like setting, the 6160 can be dressed up in its own "office" style cabinet, just like the 5160. But underneath, it will still be the most versatile, expandable, functional computer available to run factory control applications.

For more information on either the ISI 5160 office system or the ISI 6160 factory system, call us in the West at (408) 743-4442, in the East at (201) 272-3920, or in the Midwest at (513) 890-6450.



ISI International also offers an expanding array of adapter cards for use with ISI International systems, as well as IBM and other PC-compatible systems.



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*MS-DOS and GW are trademarks of Microsoft Corporation.
†VRTX is a registered trademark of Hunter & Ready, Inc.

DESK ORGANIZERS

transactions; it does not show (nor does *Bisbase* keep a record of) the previous or changed values of assets and liabilities that result from the transactions. This missing information might be crucial if you have to trace a history of financial dealings.

The scheduling system is the weakest part of *Bisbase*. For each scheduled item, you enter the time, date, and purpose. You can list these on the screen or the printer, and that's your calendar. After the scheduled meeting or appointment has taken place, you can add a comment on its outcome. At that point, the record enters your communications history.

The *Bisbase* manual is about 100 pages, with large type, a clear style, and no technical information. Although not discussed in the manual, the data files are in a format that could be used by a BASIC program. (You would have to figure out the organization of the files, however.)

The manual is evidently a product of the IMSI marketing division. It says things like "*Bisbase* can essentially replace your filing cabinet, your appointment book, your clipboard, and your accounting books." A saner statement appears on an errata sheet: "Maintains accurate financial records, not an accounting package." Heed these words if an accounting package is what you need.

When you grow tired of *Bisbase* and choose option 7 on the main menu (exit to the operating system), *Bisbase* says "It's been pleasant working with you. Bye for now." This was the only personal message I encountered in *Bisbase*. When a program speaks to me, I like to talk back: "It was a pleasure, and bye-bye to you too, Bis."

In Search of Organization

Bisbase needs an overhaul, more speed, and more attractive displays. To keep track of one's financial dealings, it needs a true audit-trail file. And IMSI should look at some of the other packages when redesigning a scheduling system that resembles the desk and monthly calendars it will replace.

The premise of *The Integrator* is fine—we really do need the ability to transfer files easily between different types of programs. ModTech has the shell; now it needs to improve the file translations so they work correctly. *The Integrator* system is structured so that real conversions could be added. Perhaps future versions will incorporate some improvements.

I can almost envision a desk empty of everything but a PC.

The Integrator calculator is a gem—if it remained resident in memory, borrowed a screen display and command structure from *Spotlight*, and hexadecimal conversions and number transfer from *Sidekick*, it could easily replace sophisticated handheld calculators for PC users.

Using calculators, desk calendars, notepads, and index cards on a PC is a convenience if they are accessible at any time. A little use of *Spotlight* or *Sidekick* and you'll probably become addicted. If *Sidekick*'s features set your heart racing, then this program is probably the one for you. *Sidekick* is a brilliant but eccentric genius—it's faster, more clever, and more versatile, but also more difficult and unpredictable. *Spotlight*, simpler to handle and less prone to strange behavior, is the clear choice for anyone who values ease of operation and overall reliability.

Now for the question on everyone's lips—will *Spotlight* and *Sidekick* work together? Almost. When utilities are called up individually, no problems result, but calling up a *Spotlight* utility will often prevent *Sidekick* from loading on top of it.

None of these programs is so good that you can throw out your calculator, desk calendar, pencils, and paper, but I'm encouraged. I can almost envision a desk empty of everything but a PC. Not quite yet, but someday, I may get organized. ■

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CIRCLE 335 ON READER SERVICE CARD

GETTING WISE WITH SOLOMON

The most sophisticated accounting software currently available for the PC, Solomon III stands alone in its field.

The Solomon III series by TLB, Inc., is the most comprehensive and sophisticated accounting software we've seen for the PC. In all, it includes 12 modules that can automate most of the accounting chores of a small business (and some larger businesses as well). The *General Ledger* is the foundation of The Solomon III system; other modules can be purchased separately, and interact with one another as shown in Figure 1.

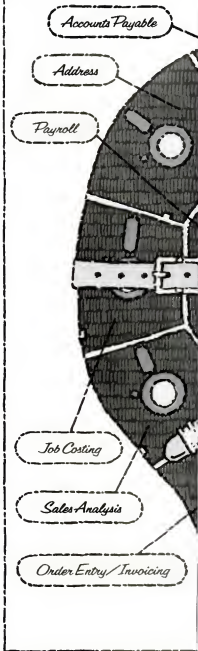
The Solomon accounting series, written in the C language, is built around *MDBS-III*, a postrelational, network-oriented database management system from Micro Data Base Systems, Inc., of Lafayette, Indiana. *MDBS-III* is probably the most powerful database system available for the PC today; a run-time version is included with the Solomon software. Solomon's key to power is its use of a single large database that contains some 800 data elements in 79 record types. A single data-

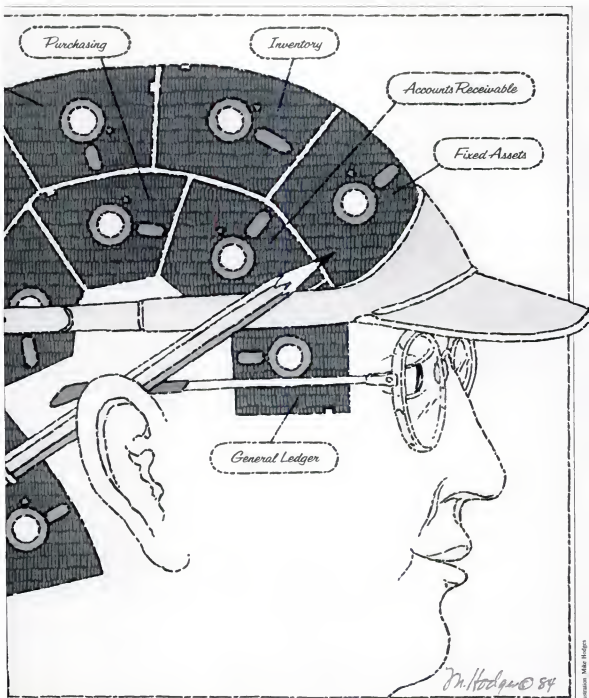
base permits one accounting entry to quickly update all relevant records. The maximum database size currently supported by the system is 12.6 megabytes. The response time for processing or verifying data is equivalent to that of comparable systems.

So that you can appreciate the overall strengths of Solomon III's design, we'll start our review with a detailed look at the system installation features. We'll also discuss each of the 12 modules, focusing on the *General Ledger* (since it serves as the foundation for the series) and *Job Costing* and *Fixed Assets* (since these applications are unique in the accounting software marketplace).

Installation

Earlier versions of the Solomon series required an expert to assist with the installation. Now, with version 3.1 of Solomon III, TLB has incorporated a front-end program that guides you through the installa-





SOLOMON III

tion process with helpful menus and prompts. (Incidentally, all of Solomon's menus and screens are clearly and colorfully designed. It would be a shame not to use a color monitor with this system.)

Each Solomon III system, sold only through authorized Solomon dealers, is shipped with two databases: a trial database and a production, or functioning, database. The trial database contains sample data, and using it is essential to learning these sophisticated systems. The production database is the one that you use for your "live" accounting records.

The system can be installed in the trial mode, called TRIAL-LOC, which lets you use all of the system's capabilities but limits you to 20 accesses of the trial or production database. After that, you may either return the software to your dealer or register it for purchase. If you decide to purchase, TLB will give you "keys" to

unlock the modules you purchased.

The complete Solomon Series package contains 20 diskettes and documentation for all the modules. Once you've transferred the programs to a hard disk, you configure the software by selecting from a number of computer/display combinations, including the new IBM PC AT.

After confirming your configuration choice, you are directed to the sign-on screen, where you can specify on which drive your database and "transaction log-file" (as discussed below) will be located. A unique, four-digit access number also appears on the sign-on screen. This number increases by one each time you sign onto Solomon; this feature might be helpful in alerting you to unauthorized attempts to access the system. If very tight controls are appropriate, the access number could also provide a reference on a log that you could keep to detail what was accomplished during each access of the database. The access number appears in the upper left-hand corner of each subsequent screen during a given session.

You must enter a password (which won't appear on the screen) before you can proceed to the master menu. As you put up the master menu for the first time, you will be prompted to specify your printer configuration. You can choose from several commonly used printer models or define the form length and control codes if the one you're using is not listed. At this point, you can begin experimenting with the screens and reports based on the sample data in the trial database.

Before entering "live" data, the system prompts you to perform certain house-keeping functions upon the "skeleton" production database. First, you estimate the size of your database, using a series of screens that asks you for volume data regarding your accounts, vendors, customers, and so on. A sample of the first such screen is shown in Figure 2. As you enter or revise these estimates, a running total is shown on the screen. Once your file sizes have been estimated, you must set up the production database to accom-

modate them. The size of a database can be increased at a later date, but never decreased. This expansion is limited by the space remaining on your hard disk as well as the 12.6-megabyte constraint currently imposed by TLB (in order to maintain reasonable operating performance for the system).

TLB provides four "initial load" files to make it easier to set up your books. Each file contains a chart of accounts, report definitions, and job phases for a corporation, sole proprietorship, partnership, or subchapter S corporation.

If one of these standard files is close to what you need, loading it and making the necessary changes is a lot easier than entering a new chart from scratch.

Finally, you have the option of loading the on-line help text for the modules you'll be working with. In total, Solomon provides some 800 pages of on-line, context-sensitive help-message text. Additional help files can be loaded or deleted at any time during the operation of the system.

After going through the general installation procedures, you can initialize the individual modules by following the specific instructions in the documentation. The manual also gives you a good set of general operating procedures for establishing a backup policy, backing up a database, and reconstructing an unusable database.

Transaction Logging

Unusable database? Ugh! As noted, the Solomon series employs a single large database to store all of your financial data. Protecting the integrity of such a large and complex body of data will be a concern. Data lost owing to system crashes could require tedious data restorations from backups, not to mention having to re-enter all of your latest transactions. Solomon's developers took this possibility into account and, with Version 3.1, added a feature called Solomon III's "transaction logging," which offers an added measure of safety against data loss.

As you make entries to a database, the



Solomon III Series Software

TLB, Inc.

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Solomon Reporter	\$595

Requires: 256K RAM, 132-column printer, one 320K floppy drive with a hard disk. Versions are available for IBM PC, XT, and AT, DEC Rainbow, and other MS-DOS systems and local area networks.

CIRCLE 724 ON READER SERVICE CARD

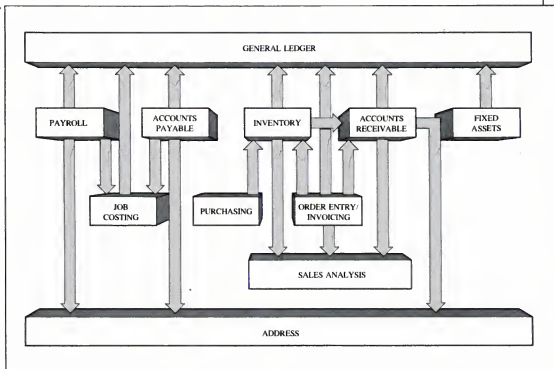


Figure 1: This diagram illustrates how the Solomon III modules interface with one another. Note that the General Ledger module is always required and that some of the other modules must be purchased in groups to function—for example, Sales Analysis also requires the Order Entry, Inventory, and Accounts Receivable modules.

transactions are also recorded in a separate file called a "transaction logfile." A new transaction logfile is created each time you access the system. If the master database becomes corrupted for any reason, such as a power outage or hard disk failure, these logfiles can be reprocessed automatically into the most recent backup of the master, which creates a new working database. (DOS batch files are available to help you through this process.) After such a database reconstruction is performed, you can delete the logfiles to free up storage space on your disk.

This transaction-logging feature is very rare. Few minicomputer systems (and no other microcomputer-based accounting

systems, to our knowledge) employ this level of sophistication in helping you maintain the integrity of computerized records.

General Ledger

The starting point in any general ledger implementation is the design of your chart of accounts. As noted above, Solomon offers you four standard chart types. The Solomon system allows for six alphanumeric characters for the natural account code and a six-character subaccount for divisions, departments, profit centers, and the like. You should carefully consider the design of your chart of accounts in order to take full advantage of Solomon's report-

ing capabilities. An intelligently structured coding sequence will facilitate the use of Solomon's account selection "masking" feature. Masking account numbers (for example, 10???? or 120???, much like the wild-card feature used to refer to similarly named groups of DOS files) makes it easy to refer to and summarize subgroups of accounts when defining a report.

After establishing your account structure, you can make changes to the standard report files or define custom reports to meet your needs. The *General Ledger* produces 14 standard financial reports, including the Statement of Changes in Financial Position, which is very difficult,

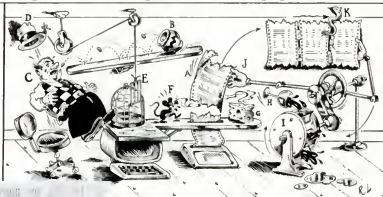
SIMPLIFIED SPREADSHEET ASSEMBLY

RISE SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBOLATED THAT HIS HAIR STANDS ON END DISLORGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GRABS THROUWING SPREADSHEET ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPED GORGONZOLA (H).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (I) INTO WATER-WHEEL (J) WHICH TURNS PULLEY THAT CAUSES GLOVE (K) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (X).



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The experts agree. PC Magazine, for example, writes: "If you've got the need, Sideways has the solution." And PC World calls Sideways "nifty . . . an easy to use program that does what it claims."

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CIRCLE 306 ON READER SERVICE CARD



SOLOMON III

00-00-0002			ESTIMATE DATABASE SIZE		Screen 98.01
Subsystem		Description	Actual No	Est No	
General Ledger	Active Acct-Subacct Combinations			900	
	No of Prds Trans Retained			3	
	Avg No of GL Trans Per Prd			200	
Payables	Vendors		D	460	
	Recurring Vouchers			15	
	Avg No of Monratur Vouchers Per Prd			75	
Receivables	Avg No of Line Items Per Voucher			6	
	Avg No of Checks Per Prd		D	50	
	Customers			400	
Order Entry	Customers Retaining Comp Data			300	
	Recurring Invoices			50	
	Avg No of Monratur Invoices Per Prd			200	
	Avg No of Line Items Per Invoice			15	
	Avg No of Payments Per Prd		D	200	
	Avg No of Open Orders			0	
				0	
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[ESC-FINISH SCREEN | INS-INSERT LINE | DEL-DELETE LINE | F5-FIELD DELETE]

Figure 2: This screen assists you in estimating the amount of disk storage that your company's data will require. This will help you determine whether your computer can accommodate the database that contains the Solomon accounting data.

D1-84-0005 REPORT DEFINITION MAINTENANCE				Screen D1.28
Tran Type(A,G,D)	C			
Report No	Description	Whole #	Parents	Cocounts & Sign
		(Y,N) N	(Y,N) N	(Y,N) N
GOLD	Coop Chg to Financial Position			
Type	Par Acct Sub	Description	Shp Col S Lvl	
P-TR	---	FINANCIAL RESOURCES WERE	1	1
C-AD	---	PROVIDED BY:	0	25
C-MOC	---	---	---	39
C-MCP	---	---	---	57
R-DN	---	OPERATIONS	2	57
R-RS	275077-777777	Net Income (Loss)	1	D
R-DN	---	ADD: EXPENSES NOT REQUIRING	2	D
R-DN	---	THE USE OF WORKING CAPITAL	1	6
R-RS	412077-777777	Depreciation	1	+
R-RS	656077-777777	---	---	+
R-DN	---	Amortization	D	+
R-RS	656077-777777	---	D	+
R-SU	---	---	1	+
R-TO	---	WORKING CAPITAL FROM OPERATIONS	1	+

* Press F1 key for help

[ESC-FINISH SCREEN | INS-INSERT LINE | DEL-DELETE LINE | F5-FIELD DELETE]

Figure 3: Here is an example of part of a report definition file. This form of coding allows you to specify which data are to be output on each line of a report. It also gives you considerable flexibility in formatting your reports. While the coding looks complicated, the documentation does a good job of explaining it. Solomon's "initial load" files will do this coding for you, although you may want to customize it a bit.

if not impossible, to generate with most other micro-based report writers. Figure 3 shows an example of a report definition screen. While it appears complicated at first, we found that the documentation was quite effective in explaining the conventions used. The latitude in defining custom reports offered by Solomon's *General Ledger*-based financial report writer is among the best we've seen in a microcom-

puter accounting system. The financial report print specification screen lists all the reports you've defined and permits you to select one or more reports to be printed in a nonstop sequence.

One very useful standard report includes a ratio analysis that highlights your company's financial performance. This report includes a set of 20 commonly used financial ratios related to liquidity, debt

coverage, profitability, and so on. Such ratios can help you monitor financial trends and give an early warning of changes in your company's financial condition.

The Solomon system has a full complement of audit-trail, transaction, and account-balance listings, including a trial balance and listings of posted and unposted transactions. On top of all this, the *Solomon Reporter* module can generate all sorts of additional ad hoc reports.

Budget data can be maintained on an annual or period-by-period basis for each account. You can also record and report two "memo" amounts with each account. For example, you might want to report additional information such as the fair market values of investments or projected budgets for future years.

Transactions are processed by grouping them according to their batch and journal types. You can define transactions as one-time (nonrecurring) journal entries, automatic entries (recurring journals in which the amounts don't vary), and manual journal entries (which are typically used to define standard sets of transactions that vary in amount only). The number of times that a recurring journal entry is to be repeated can be specified. You can stipulate that a batch is to reverse automatically at the beginning of the next accounting period. This is particularly useful for disposing of expense accruals. A two-character code can be entered to designate a journal type for which detailed listings can be produced.

At year's end, transactions can be summarized or deleted to make more room in the database for additional transactions in the current year. You can also generate a consolidation transaction file that can later be transferred to another Solomon database. The beauty of this feature is that it enables you to produce consolidated financial statements—that is, for multiple companies. Few PC-based systems perform this function so handily.

We are quite impressed with the Solomon *General Ledger*. You must buy the

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CIRCLE 475 ON READER SERVICE CARD

SOLOMON III

General Ledger if you want to use any of the other subsystems in the family, but this module is a blessing, not a burden.

Payroll

Solomon's *Payroll* module is a model of flexibility. It offers you a degree of latitude not found in comparable products. You can define the variables that go into the payroll computations—such as earnings types, deduction types, exemptions and credits, pay rates, pay groups, and work locations—and most of the commonly used formulas for computing deductions are available. A notable feature permits you to define certain deductions applicable to each work location—a boon if you have employees who work in various locations and are subject to different local income tax withholdings. This feature also lets you generate W-2 forms for different tax jurisdictions.

Four pay frequencies are supported by the *Payroll* module: weekly, biweekly, semimonthly, or monthly. Hourly, salaried, or exception employees can also be handled. If you use the *Job Costing* module, you can specify the job, phase, and cost type when entering payroll data. The *Payroll* module maintains data for terminated employees for year-end W-2 purposes, but their status is flagged to prevent additional payroll adjustments.

One rather unique feature of the Solomon *Payroll* module is the check reconciliation function, which allows you to reconcile the payroll checks cleared by the bank with the original checks produced by the system. You enter information on the checks cleared by the bank; if an amount differs from the amount of the original check, a warning message flashes on the screen. This capability can be a real time-saver, and it could help you detect payroll checks that have been tampered with.

Listings and reports are available to reduce the payroll data into summaries by type of input, labor distribution, earnings type, work location, and so on. Payroll checks can be produced in a fixed format only. While actual W-2 forms can be

printed, only a summary worksheet is available for the Employer's Quarterly Federal Tax Report (Form 941).

Accounts Payable

Solomon's *Accounts Payable* module is a solid member of the Solomon accounting series. It uses the "voucher" approach to recording and tracking amounts due vendors—that is, each invoice is assigned a voucher number in order to provide a chronological sequence to outstanding invoices.

Processing vouchers and adjustments is straightforward. We find it somewhat unusual that you can enter duplicate batch

You must buy the
General Ledger if
you want to use
any of the other
subsystems in the
family, but this
module is a
blessing, not a
burden.

numbers for vouchers, though a warning is displayed if you do so. Several reference numbers—a purchase order number, an invoice number, and a user-assigned reference number—can be associated with a voucher. This feature is useful to help prevent duplicate payments. If you use the *Job Costing* module, the job ID, phase code, and cost type can be entered as well.

Multiple checking accounts can be used for making your accounts payable disbursements. Only a single print format for the checks is available. This limitation (not being able to customize the format of checks, statements, and the like) crops up in several of the Solomon modules, and it's somewhat incongruous given the over-

all sophistication of this system.

While the *Accounts Payable* module provides for processing recurring payments, such as rent, procedures for dealing with one-time vendor payments could be improved. As it stands, a dummy vendor account is about the only way to conveniently handle such payments. You can input manually prepared checks—the system will adjust the voucher balances so that the outstanding balances displayed during check-printing are correct. If outstanding checks must be voided, all transactions originally generated for the check can be automatically reversed. Here, as with the *Payroll* module, you can reconcile checks cleared through the bank with those produced by the system.

The reports produced by this module are comparable to those of other accounts payable systems available for the PC. (You can only make accounts payable so exciting, right?) One notable perk in the Solomon system, however, is that you can define aging periods for payables.

Purchasing

A purchase-order management facility is not easy to come by in micro-based accounting families; Solomon's *Purchasing* module is one of the few. It can help those responsible for purchasing in your company to compile and develop orders, and it automatically updates inventory records for subsequent receipts.

Four types of orders can be processed: regular orders, blanket orders, standard orders, and drop ship orders. You record all the information that is pertinent to an order on the purchase-order input screen; vendor information and inventory ID are required if you are interfacing with the *Accounts Payable* and *Inventory* modules. If you want to confirm that a vendor complies with all the terms of an order before shipping, you can place a message to that effect on the purchase order. Purchase orders can be printed in only one format. Change notices are printed on the same forms, with the words "Change Notice" printed under the heading.

Continued

When you input data associated with the receipt of goods (in which the quantity received is equal to or greater than the quantity ordered), the status of an order is automatically recorded as "Completed," and your inventory is increased by the amount received. You can enter a warehouse location where the item will be stored or default to the warehouse ID that is stipulated in the inventory module.

A variety of useful reports is available. Status reports on open orders can be produced separately or together, sorted by order number, vendor, order status, or order type. With these reports, you should be able to account for every purchase-order number in the series. A report of anticipated deliveries is useful to alert receiving supervisors of incoming orders. A receipts listing can help you locate items received during a given period. Finally, the open requisition listing can be used to trace requisitions to purchase orders.

Order Entry/Invoicing

TLB designed its *Order Entry/Invoicing* module for processing orders received through the mail or written on an order form. It is not meant to account for point-of-sale applications, which are common in the retail industry. This module must be used in conjunction with the *General Ledger* and *Accounts Receivable* systems and, at your option, can be used with the *Sales Analysis* and *Inventory* packages as well. We'll assume you're using the full complement of Solomon packages in the following discussion, and you'll see how the *Order Entry/Invoicing* module, perhaps better than any other, exhibits the benefits of a well-integrated accounting system.

Six types of orders can be processed: regular orders, back orders, cash sale orders, blanket orders, standard orders, and drop ship orders. As you begin entering a sales order, the system checks the customer's credit information. As an order quantity is entered, the system checks to see if the item is available in inventory. If a requested item is out of stock, a descrip-

tion of a product that can be substituted for the ordered item is displayed. Sales prices are also automatically displayed, and a second credit check is performed after all the items on a new order are totaled.

If the order can be filled, a sales order form is printed for use in the warehouse

When invoices are printed, sales totals for inventory items, customers, and salespersons are automatically updated.

and shipping areas as a picking list or packing slip. After the shipment is made, invoices can be prepared with the information returned from the shipping area. An invoice preview listing can be generated to review invoice data before printing the actual documents. At this point, you can review the general ledger and accounts receivable journals resulting from these transactions. Debit and credit memos can also be processed readily and reviewed before printing.

When invoices are printed, a back order is automatically created for incomplete shipments. Sales totals for inventory items, customers, and salespersons are also automatically updated. Last but not least, a journal entry is created for all items that update the general ledger.

Job Costing

A good job-costing system is a necessity in many types of businesses, such as construction, fabrication, and even professional services such as law, accounting, and consulting. While not generally necessary for financial reporting, job-cost data is very useful to those who must manage profitability and justify billings related

to a particular project or client.

If you are to make full use of Solomon's *Job Costing* module, the *Accounts Payable* and *Payroll* packages must also be implemented. Unfortunately, integration with the *Inventory* package isn't available—this would have come in handy for "job shop" businesses that work with stocked materials.

You can define your own job and phase number and cost type scheme as you initialize the Solomon *Job Costing* system. You input and maintain general information about a job and then initialize direct job-cost adjustments, customer-cost adjustments, work-in-progress, and previously allocated overhead. Budgets can be input based on units and/or cost. Overhead cost allocations can be set up based on any phase/cost-type combination according to user-defined rates.

Because many of your job costs will automatically enter the system via its interface with the *Payroll* and *Accounts Payable* modules, your use of the *Job Costing* module will be limited to establishing jobs and entering adjustments and overhead allocations.

When a job has been finished, but before recording billing amounts for a job, a prebilling worksheet can be produced for your review. After final adjustments, billings related to each job can be recorded. Once a job has been billed, or completed, you'll have to relieve work-in-progress by entering direct cost adjustment transactions.

Inquiry and reporting capabilities can make or break a job-costing system. Figure 4 illustrates the kind of information about a job and job-to-date progress that you can review with Solomon's *Job Costing* module. You can generate listings for all your defined job-cost parameters and transactions as well as the following reports: detailed job-cost analysis by phase or cost type, summary job-cost analysis by job ID, detailed units analysis by phase, overhead allocation report, job (general ledger) distribution report, and summary billing report by job ID.

This series of reports should meet the reporting needs of most managers.

Fixed Assets

Accounting for fixed assets can be one of the accountant's most complicated tasks because of the myriad of tax laws that dictate the calculation and recording of capital costs, depreciation, and leasing costs. Various reports that are required to comply with federal and state government regulations add further to the confusion.

Solomon's *Fixed Assets* module allows you to maintain separate depreciation records for financial and federal tax purposes in addition to any number of optional requirements (for, say, state tax reporting). Because assets can be coded by location, you could create as many tables as necessary to handle the differing state or local tax requirements. You could also use this facility to create your own "what if" computations. It should be noted that only the figures produced with the module's financial computation method can be automatically posted to the *General Ledger* module.

The system supports both the Accelerated Cost Recovery System (ACRS) for assets placed in service after 1980 and the Asset Depreciation Range (ADR) for assets placed in service before 1981. ACRS tables are included, as are the ADR straight line, declining balance, and sum-of-years digits methods of calculating depreciation. The system also provides for selecting the limiting expensing option under Internal Revenue Code Section 179 and the Investment Tax Credit (ITC) under Code Section 38. ITC can be computed on either a full-asset basis or on the ITC percentage-reduction basis as prescribed by the Internal Revenue Service. It even checks whether the Section 179 or Section 38 (used property) limitations have been exceeded. If all this tax jargon is confusing to you, you should consult a tax advisor to help you evaluate whether the system meets your needs.

The Solomon system computes depreciation at a daily rate, thus allowing great

01-84-0004		JOB INQUIRY	Screen 06.20
INQUIRY		JOB-TO-DATE PROGRESS	
Trans Type (A,C,D,I)	I	Reported Percent Complete	15
Job ID	J00001	Computed Percent Complete	0
Description	Banker's Trust Branc	Revision Date	09/13/84
Job Manager	001	Original Budgeted Units	0
Customer ID	BANKER	Original Budgeted Cost	138000
Contract ID	B06668SH	Revised Budgeted Units	0
Cost Method (PC,CC)	CC	Revised Budgeted Cost	171000
Job Type (FF,CP,TH,IN)	FF	Units	0
Job Status (S,A,I,B,C)	I	Cost	0.00
Status Date	07/16/83	Current Variance	25650.00
Estimated Start Date	05/06/83	Projected Variance	-171000.00
Estimated End Date	05/21/84	Estimated to Complete	0.00
Last Invoice Date	01/16/84	Standard Rate	0.00
Retain Detail Job-to-date (Y,N)	N	Estimated Revenue	26250.00
Original Contract	150000.00	Billed	0.00
Revised Contract	175000.00	Over/Under Billed	-26250.00
Revision Date	02/23/84	Estimated Margin	26250.00
A Complete Base Type (U,C)	C	Unbilled Cost (WIP)	0.00
* 14 Enter "E" to exit screen or press RETURN to continue * Press F1 key for help (ESC-FINISH SCREEN INS-INSERT LINE DEL-DELETE LINE F3-FIELD DELETE)			

Figure 4: You can see on this screen some of the job-costing information that can be maintained for your projects. The inquiry screen is particularly useful to managers who want to closely monitor the economic status of their jobs.

flexibility for analyzing dispositions and acquisitions. In the case of a mass disposition or write-off of assets, Solomon allows you to delete large numbers of

ID number, class, location, or general ledger account.

When integrated with the full complement of Solomon software, the *Fixed Assets* module is a standout. Only a few standalone, special-purpose fixed-assets packages parallel this module's capabilities.

Accounts Receivable

Solomon's *Accounts Receivable* module can operate with the *General Ledger* module alone or, to take full advantage of its capabilities, can be integrated with the *Order Entry/Invoicing, Inventory, Sales Analysis, and Address and Mail List* modules.

Figure 5 illustrates the customer information that can be maintained. For each customer, you can process receivables on either a balance-forward or open-item basis. Cash received in payment for balance-forward accounts cannot be applied to specific documents.

Recurring invoices can be set up for customers as required. You can also enter information from manually prepared invoices into the system. Unfortunately, the *Accounts Receivable* module doesn't ease the burden of processing invoices for one-

When integrated
with the full
complement of
Solomon software,
the *Fixed Assets*
module is a
standout.

assets from your records in one operation. You can generate a schedule of projected depreciation over a 5-year period; this feature is very useful for both budget- and tax-planning purposes.

You can obtain summary and detailed information on your fixed-asset transactions from a variety of listings. You can sort the fixed asset portion of the database by acquisition period, disposition period,

SOLOMON III

```

01-84-0007                                CUSTOMER MAINTENANCE                                Screen 08.26

Tran Type(A,C,D,I)  C                                Custnear ID                                281547
Billing Address ID                                ALISAY                                Shipping Address ID                                ALISAY
Name                                Angel Alliswey Productions, Inc                                Angel Alliswey Productions, Inc
Attention                                Miss Zickfoose                                Miss Zickfoose
Salutation                                Dear Miss                                Dear Miss
Addr Line 1                                133 East 33rd Street                                133 East 33rd Street
Addr Line 2                                Suite 4440                                Suite 4440
City                                Hoboken                                Hoboken
State, Zip                                NJ                                20421                                NJ                                20421
Telephone                                (900)372-1000                                Ext2030                                (900)372-1000                                Ext2030
Telex                                129043                                129043
TWX                                549-430-7690                                549-430-7690

Quat Cless                                0001                                Statseent(Y,N)                                Y                                Tarea ID                                04
Billing Type(O,B)                                O                                Dun Message(Y,N)                                Y                                Ship Complete(Y,N)                                N
Stat Cycle                                01                                Finance Chg(Y,N)                                Y                                Credit Let                                50.00
A/R Acct Sub 1110                                000000                                Salesmen ID 123                                Y                                Lat Inv Date                                09/14/84
Invoice Acct 3030                                000000                                Price Level ID                                --                                Lat Stat Date                                --/--/
Cooperative Data(Y,N)                                Y                                Yrede Disc Pct 0.00                                --                                Inv Substitution(Y,N)                                Y
Yex Code 1                                NY                                Yex Code 2                                --                                Yex Code 3                                --
# 20 Enter "N" for next screen, "E" to exit, or press RETURN to continue

[ EDC-FINISH SCREEN | INS-INSERT LINE | DEL-DELETE LINE | F3-FIELD DELETE ]

```

Figure 5: The customer maintenance screen in the Accounts Receivable module gives a good indication of the useful information that can be kept on each customer. A second screen for each customer displays account aging status, balances, and other detailed financial information.

time customers. Finance charges can be established for and applied to customer accounts, and you have a great deal of latitude in controlling the finance charge rate, minimum finance charge, and compounding of finance charges.

Customer statements can be printed, but only in a single format. One of several different dunning notices can be printed on the statement. Which message appears will be a function of the age of the customer's oldest overdue invoice—you specify the aging periods. Finally, the system will generate a number of useful reports to help manage your open customer accounts.

Sales Analysis, Inventory, and Address List

The *Sales Analysis* module draws from current period and year-to-date sales information produced by the *Order Entry/Invoicing, Accounts Receivable, and Inventory* modules. *Sales Analysis* produces five summary reports that show sales by inventory item, product class, customer, customer class, or salesperson. Period-to-date detail reports list sales by inventory item, customer, or sales representative.

Sales commission data is included.

This module also allows you to maintain a database of information and statistics about your sales force.

With the *Solomon Inventory* module, you can process and maintain a perpetual finished-goods inventory. It can be used with just the *General Ledger* or, ideally, in conjunction with the *Order Entry/Invoicing and Accounts Receivable* modules.

Inventory item numbers and product classes can be established to reasonably account for and group your inventory for reporting and record-keeping purposes. Each inventory item must be categorized in one of six valuation methods: standard, FIFO, LIFO, specific identification, moving average, or a user-specified valuation method.

Multiple lots or serial numbers and warehouse or location IDs are used to identify and locate inventory on hand. You can maintain user-defined price levels based on customer, unit of measure, or volume of sales. Replenishment methods by inventory item ID can include a fixed reorder quantity or fixed reorder cycle.

A full complement of reports is available to list inventory transactions and

report on the status of your inventory items.

Solomon's *Address and Mail List* module does the chores needed to maintain vendor and customer addresses and print mailing labels. It interfaces with the *Accounts Payable, Accounts Receivable, and Payroll* subsystems. Other addresses of importance to you can be maintained as well.

The Solomon Reporter

The *Solomon Reporter* is a complete version of the MDBS Query Retrieval System, with customized documentation. With it, you can generate ad hoc reports by extracting data from the Solomon database. The reports can be sent to either screen or printer.

The syntax and functionality of the *Reporter* module are comparable to IBM's SQLDS mainframe query processing language. The files created can be written in DIF or ASCII formats so that they can then be imported into other software such as, say, Lotus's 1-2-3 spreadsheets. A detailed discussion of this package is beyond the scope of this review—suffice it to say that it offers a very powerful way to create custom reports. We suggest that you inquire about the details with a dealer or consultant if you have special reporting requirements.

Incidentally, a version of the powerful and popular *KnowledgeMan* database scheduled for release during the first quarter of 1985 will be able to act as a front-end to *MDBS-III* databases (and that includes Solomon's), which will provide even more options for analyzing, summarizing, and reporting on your accounting records.

Documentation

Solomon's extensive on-line help facility minimizes the need to refer to printed documentation, but, for reference, complete documentation for all of the Solomon modules (except *Solomon Reporter*) is available in one volume. The *Reporter* has a volume and slipcase of its own. We



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found the documentation to be very thorough and well organized.

Several forms comes with the documentation, including a backup log and a report layout worksheet. Hard-copy forms for all of the system-produced documents (checks, statements, invoices, and so on) are available exclusively from Rapid-

Solomon's Address and Mail List module does the chores needed to maintain vendor and customer addresses and print mailing labels.

Forms of Bellmaw, New Jersey; an order blank is enclosed in the manual.

With all its power, the Solomon accounting series will not be appropriate for all small businesses, but it is certainly an alternative worth considering. Because of its many sophisticated features, the series can probably be used by many medium-size businesses as well. For example, the CEO of a major New York City financial institution reportedly uses consolidated financial reports prepared with the *Solomon Reporter* to sort and combine divisional and subsidiary accounting data from his company's offices around the country.

Just as *MDBS-III* was said to be in "a category all its own" when compared to other database products in *PC Magazine's* Project: Database (Volume 3 Number 18), so stands the Solomon system in the accounting software domain. While there are many other fine accounting systems on the market, we can appreciate why Solomon calls itself "The Serious Accounting Software." —G. William Dauphinais and Michael A. Yesko

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The HP 110:

The Next Step In Portables

To many people a portable, or lap-size, computer is merely a watered-down version of a workaday desktop machine, small in size and limited in power. Only big machines that take up valuable desk space deserve serious consideration.

The Hewlett-Packard HP 110 will change this outdated perception by showing how much can be tucked into a small package. In its latest portable release—its first intended for a general-consumer, rather than a business, market—Hewlett-Packard has included a CMOS version of the 8086 processor, MS-DOS 2.11, a modem, a telecommunications program, a word processing program, and even Lotus's 1-2-3 in ROM! The HP 110 has 382K of ROM and an additional 272K of RAM, divided between available memory for programs and an electronic disk. The liquid crystal display (LCD) can produce graphics (including 1-2-3 graphs) and 80 columns by 16 lines of text.

A Briefcase and an LCD

All this is neatly tucked into a 13- by 10- by 3-inch package that looks much like a little briefcase and weighs only 8.5 pounds. The main case is made of the creamy-white plastic that corporate buyers are reported to prefer.

The LCD display forms the top part of the case, folding down like a lid that fits over the keyboard, and is connected to the case by two hinges at the back. These

hinges are slightly stiff, so that you can adjust the tilt of the screen. The top is held down by two spring-loaded clips, requiring two hands to open.

While LCD displays provide obvious benefits to developers of portable computers in that they consume little power and are lighter and thinner than cathode-ray tubes, they do have drawbacks. For instance, you will probably want to use a portable computer in a variety of settings—under incandescent lighting at home, fluorescent lighting at the office, and in daylight during a daily commute. Unfortunately, the HP 110 LCD display is difficult to read under anything but ideal conditions. The angle of the display must be just right; even so, glare can be a problem. The hinges hold the screen at a steady angle when sitting on a desk, but in your lap, the screen sometimes sags. There is a screen contrast button that simply makes the characters fainter or darker. I prefer the solution of the Radio Shack Model 100 or the NEC portable, which let you adjust the angle of the crystals in the display itself so that you can usually eliminate glare and get a clear image.

The typeface used on the 110 display is a trendy and sometimes confusing design (similar to the Broadway type font, for those of you who are familiar with typefaces). In the HP 110's inverse display, the type looks worse.

The keyboard is full size, with Selectric-style keys. Most of the nasty lit-



The HP 110 may dramatically alter your preconceived notion of portable power. This machine shows you just how much computing capability can be tucked into a small package.



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CIRCLE 187 ON READER SERVICE CARD



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the keys of the IBM PC have been moved out of the way (although in some cases they are hard to find). Eight programmable function keys are strung along the top edge of the keyboard, along with other special function keys and the four cursor control keys. These arrow keys are in a horizontal line—an arrangement that takes some getting used to.

What's Missing

The keyboard is interesting for what it doesn't have. There is no Alt key; an "Extend char" key performs the same type of function. There is no numeric keypad. Perhaps most striking is the absence of an On/Off switch. How do you turn it on? Just press any key, and it "wakes up." You exit with a function key command, which turns the computer off. If you leave it running on its battery, the HP 110 will turn itself off after sitting idle for a length of time, which you can specify. If you crash the computer, as I did repeatedly, you may search in vain for a reset key. To reset, simply hold the contrast adjustment key for 15 seconds.

The keyboard has a soft touch, offering up a mushy keystroke that PC users may have difficulty adjusting to.

Power is supplied by a typical calculator transformer, which recharges an internal battery pack. When the computer first powers up, it shows how much charge is left. If the reserve drops below a certain level, the keyboard locks up until the

charge has been restored. This protects you from running the system down so far that you lose what is in memory.

When you first turn on the HP 110, it

displays the time, date, and a list of applications that are available. You select one by moving the arrow-shaped pointer to the function you want and then pressing



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CIRCLE 720 ON READER SERVICE CARD

Return. This is a tremendous improvement over the cryptic "A>" that MS-DOS greets you with.

This friendly helper is named PAM,

which stands for Personal Applications Manager. Through these menus, you can perform almost any DOS function without having to memorize syntax or commands.

The function keys are labeled at the bottom of the screen, so you can quickly see what your options are. One problem is that the labels are wider than the keys, and this setup can be quite confusing. While the F1 label is near the F1 key, the F8 key is directly under the F5 label. As a result, you need to do a bit of careful thinking

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CIRCLE 459 ON READER SERVICE CARD

Though unequal in quality, the three applications programs that come with the HP 110 are all useful. The best is 1-2-3.

before you choose which function key to press.

PAM can be a bit cumbersome to work with, especially when all you want to do is check the directory of a disk and then delete a set of files. If you prefer, you can easily slip into DOS to execute commands. Then type EXIT at any DOS prompt, and you'll be back in PAM again.

It is a simple matter to create new PAM menu listings for additional programs you may have on either electronic disk or external storage. All it takes is two lines in a text file, which you can generate using the COPY CON filename method, with your favorite word processor, or with the word processing program that comes with the computer.

Standard Equipment

Though unequal in quality, the three applications programs that come with the HP 110 are all useful. The best is clearly 1-2-3. Since it is in ROM, it loads in less than 3 seconds. You can create and save worksheets and even view graphs on the screen. If you have the ThinkJet ink jet printer, you can get screen dumps of the

graphs. Not all of 1-2-3 is included in ROM; the programs *PrintGraph*, *Tutorial*, and *Utilities* are supplied on a separate disk.

The *Terminal* program is almost as complete and easy to use as Lotus's 1-2-3. You can set up separate configuration files that will automatically set the proper protocol settings for almost as many different on-line services as you want. If you use the built-in modem, you are restricted to 300 baud, but for greater speeds you may also use the HP 110's serial port to drive an external modem if you choose. You may specify a phone number for the configuration file, and the HP 110 will automatically place the call for you. You may select pulse or tone dialing, and you may even include complex logon strings to speed your connection. Each configuration file can have up to 250 characters of logon information; should you exceed this generous limit, you can create a separate text file of commands of much larger size, which can then be called up during the sign-on process.

The weakest link is the word processor. Its name, *MemoMaker*, is a good indica-

given result, *MemoMaker* generally offers one. It makes strange use of the function keys, which are hard enough to use owing to their labeling problems. *MemoMaker*

presents the additional burden of inconsistent assignments. Pressing the "Extend char" and Char+ keys together toggles you between insert and typeover modes,

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If you use the built-in modem, you are restricted to 300 baud, but you may also use the HP 110's serial port to drive the external modem of your choice.

tion that it is not intended as a serious word processing program. True, it does have the prerequisite block functions, and you can search, replace, and control the format of the printout. However, where most programs give you multiple ways to achieve a

but pressing "Extend char" and Char—brings up the delete mode.

While \$3,000 for the features just outlined is a bit extreme, the HP 110's ver-

satility does not stop with these three programs. It is possible to import other programs and data files to become part of the available tools resident in the machine's

memory. Of the 272K RAM, you can partition as little as 16K or as much as 176K for electronic disk storage. Since this is an MS-DOS machine, the possibilities seem endless.

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Each configuration file may have up to 250 characters of logon information.

different ways that you can get programs and other files into memory. The most straightforward method is to attach one of HP's battery-powered 9114A disk drives, which use the Sony 3.5-inch microfloppy. The drive is an extra-cost item (\$795), but it makes it easy to load in programs like *dBASE II*, *Multiplan*, and *WordStar* that third-party vendors have made available in HP 110 versions. You can have up to eight external drives.

The second way is to use the modem to download programs and data from other computers. This has its limitations, including slow speed and possible errors in transmission across phone lines.

The third method is to use the HP Portable Desk Top Link, which is an add-on board for your desktop computer and connects via the HP Interface Loop. At present, there are two versions: one for the HP 150 touchscreen computer and another for the IBM PC, both costing between \$125 and \$150.

An HP Interface

The HP 110 peripherals connect using the HP Interface Loop (HP-IL). Both the computer and peripherals have an "in" connector and an "out" connector. First, link the computer to the printer by hooking two cables to the corresponding connector of each device. Then, to add another peripheral, simply create a loop, so that the "in" connector of the computer is attached to the "out" connector of the

HP 110

printer. Attach the "in" connector of the printer to the "out" of the next peripheral, and continue on in this way, adding as many peripherals as you wish. The cables hook together to become their own extension cords, allowing any two devices to be joined at up to 30 feet. Adapters for parallel printers fit easily in the loop. The one hitch, however, is that you must turn on *all* items on the loop for the system to work properly.

Linking with the PC

Installation of the IBM board is a snap: just drop it in an available slot. If you are using a variety of other cards, you may run into a conflict over memory addresses. The Portable Desk Top Link card comes set for address 1700 hex, but there are DIP switches that permit you to change this if necessary. Used with an IBM PC-XT with only a monochrome display adapter, the card worked fine without a change of the settings.

Then you load *HPLINK*, a program from a disk provided by Hewlett-Packard in IBM format. One interesting feature is the fact that the entire documentation for the Desk Top Link card was provided on this disk. This interactive reference was helpful, but to gain the greatest benefit

I was able to use the XT's hard disk as storage for the HP 110; the little computer was able to read and write to the IBM disks.

from it you will want to print out the screens for reference as you are working with the program.

Once you run the program, you can use your IBM to provide you with extra disks, or you can use it as a printer, or as a screen

The Brand NEW Fancy Font 2 printed this ad on an Epson FX printer

Letter Quality

Say goodbye to correspondence quality and hello to *Fancy Font's* high-resolution, proportionally spaced, letter quality. Fonts are available in sizes from 6 to 72 points; styles include Roman, Bold, Italic, Script, Old English, and more. All this on low-cost dot-matrix printers. *Fancy Font* is an easy-to-use software package, developed by SoftCraft, Inc., for IBM PC compatible systems and CP/M systems; no special hardware or installation is required.

New Features Now Available in Version 2

The latest version of *Fancy Font* takes advantage of the phenomenal resolution of the Epson FX and RX printers to achieve laser printer quality. High resolution versions for the Toshiba 1350, 1351, 1340 and the Epson LQ-1500 will soon be available.

This version boasts a greatly expanded set of formatting commands, including word-wrap. Special typesetting features such as kerning and automatic ligature formation are provided by an optional utility.

As part of our library of fonts and utilities we have packages that make *Fancy Font* directly compatible with *Microsoft Word*, *Wordstar* and *Valdore*; if you know how to use any of these word processors then you already know how to use *Fancy Font*. Alternatively, you can still use almost any word processor to create a text file to be printed with *Fancy Font*.

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Fancy Font customers are constantly discovering new applications.

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for the HP 110. You select the function from a three-item menu on the screen. Perhaps the most useful item is the external disk function. I was able to use the XT's

hard disk as storage for the HP 110; the little computer was able to read and write to the IBM-format disks and could call for directories and run programs, just as if the

disks were part of the portable.

However, the Portable Desk Top Link card was not without its snags. The on-line documentation fails to remind you to go back and change the system configuration file to reflect the presence of two additional drives. To further complicate matters, since the HP assigns letters to the drives in sequence, you must sidestep on the XT by



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CIRCLE 180 ON READER SERVICE CARD

A writer could use the 110 to write on while traveling and then transfer the drafts to the IBM to be edited with a more powerful word processor.

using the ASSIGN command to reroute requests for drive B: to drive C: (the hard disk). It gets confusing, since the HP refers to the IBM first drive as drive C: and the next as drive D: (the hard disk on the XT). As a result, before asking to log onto a different drive, you must think twice to be certain that it is the one you want.

Compatibility

Unfortunately, transporting information from an IBM to the HP 110 is not as useful as it could be. In spite of being an MS-DOS machine, the HP 110 is not very compatible with the IBM.

Data files, such as text files and Lotus worksheets, transfer very nicely, and this alone could make the HP 110 a good investment. A writer could use the 110 to write on while traveling and then transfer the drafts to the IBM to be edited with a more powerful word processor. A salesman could develop Lotus worksheets on an IBM and then copy them into the 110 for sales calls. With the ThinkJet along, variations could be quickly dumped onto paper, including graphs.

(continued)

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PC&E086

If programs are what you want, however, the plot thickens. The processors are different, the screen display is different, and, internally, there are many more dif-

ferences between the IBM and the HP 110. We tried loading and running a variety of IBM programs on the 110, and vice versa, to no avail. You need different ver-

sions of given programs to work on either machine.

The printer option allows you to route printouts to the printer attached to your IBM. This could be a useful feature, since it means that you would not have to purchase another printer or interface item for your system. The screen option is quite disappointing, since it merely uses the IBM screen as a printer, scrolling the text on the screen instead of on paper. It is *not* the equivalent of an external terminal for the 110.

It's interesting to note that since the 110 has the *HPLINK* software built-in, one HP 110 can serve as external disk drives for another, facilitating file transfer between machines.

A Landmark

For all of its problems and quirks, the HP 110 is a triumph and an important step in the development of a truly useful and portable computer. Its bundled software and more than half a megabyte of com-

If you need to carry data files around and work on them while on the go, especially text files or spreadsheets, then this machine has some important advantages for you.

bined RAM and ROM make its \$3,000 price tag reasonable. The clever interface design, rechargeable batteries, and built-in modem are icing on the cake.

On the other hand, both the keyboard and the LCD display pose problems. The availability of programs is a small issue, since many of the big-name products appear to be on the market. However,

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CIRCLE 379 ON READER SERVICE CARD

HP 110

since only the data files are interchangeable, you will have to plan on buying new versions of your existing IBM products if you want to run them on the 110.

The HP 110 is perfect for some people. If you need to carry data files around and work on them while on the go or away from your desktop machine, especially text files or spreadsheets, then this machine has some important advantages for you. Keep in mind that you'll still probably want a bigger machine for storage and complex processing.

The rest of us should remember that this is only one of the first MS-DOS battery-operated portables. A host of competitive machines have been announced or are just over the horizon. The next few months may provide some powerful alternatives to this early entry in a potentially huge market.



Hewlett-Packard's HP 110 can easily exchange data with the PC, and, better yet, all of its power is packed into a little briefcase weighing only 8.5 pounds.

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The Witness is a text-based murder mystery, with no graphics other than those supplied by your imagination, which are magnificent, of course. Every room, person, object, and situation is described by well-written prose, but much is "hidden" from view and can only be uncovered through clever detective work.

Your investigation will be accomplished by means of the keyboard with full-sentence commands. None of that simple LOOK WINDOW stuff here. You can LOOK OUT THE WINDOW, EXAMINE THE WINDOW SILL CAREFULLY, THEN FINGERPRINT

IT, and so forth in a seemingly never-ending variety of sentences.

The generous 711-word vocabulary is balanced by the scant number of rooms or locations in the game—only 28. Every command you type counts as only 1 minute of your 12-hour deadline, but the plot is so thickly woven and some clues so difficult to unearth that you may wish you had 12 days! Fortunately, you can ASK DUFFY FOR HELP any time you

feel stuck. Sergeant Duffy works for you and will appear on request to give hints or run evidence to the lab for analysis.

As to the depth and flavor of the mystery itself, well, *you* be the judge:

Freeman Linder has asked you to his house this evening because he received a threatening note from a man named Stiles, who was having an affair with Linder's wife until she committed suicide. Stiles blames Linder, and Linder,

```

office path                                     time: 8:00
>Look around
(side yard)
This is a little-used side yard, hidden from the street by the fence. The
back yard lies to the east and the driveway to the west.
A fresh row of foot prints goes from the back yard to the driveway.

>Examine the footprints
The prints are lined up in an even row, as if made by a careful walker.

>Walk east
(office path)
You are on a path made of stepping stones, which leads from the back gate
at the south to Linder's office at the north. In the east you can see a
thick woods. To the west is the side yard.
There's a muddy handgun here.

>Take the muddy handgun
You are now carrying the muddy handgun.

>Examine the muddy handgun
The gun is muddy from the ground, but you can see it's just a cheap
low-quality handgun.

>Fingerprint the handgun.
  
```



The Witness

Infocom, Inc.
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CIRCLE 795 ON READER SERVICE CARD

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CIRCLE 496 ON READER SERVICE CARD

PC ARCADE

Stiles. Phong, the Asian butler, greets you at the door and ushers you to the living room. Linder and his daughter, Monica, are there. Monica isn't much help when you question her, but she reveals contempt for her father.

Linder wants to talk to you alone and takes you down the hall to his office. Monica leaves to meet her boyfriend at the movies. Linder shows you the note, and you start asking questions. He doesn't seem to be all peaches and cream, but just as your conversation gets interesting, you hear the doorbell. Phong doesn't seem to be answering the door. Suddenly Linder looks at the window and shouts, "Stiles!" A gun is fired, and Linder falls to the floor, dead.

Sergeant Duffy nabs Stiles running from the office window, handcuffs him, and bring him into the living room. You begin a search of the house, but the evidence you turn up doesn't exactly solve everything. To get the truth from a suspect (there are only three: Monica, Phong, and Stiles), you may ASK your suspect about the evidence, SHOW it to him or CONFRONT your suspect with

it, or ACCUSE your suspect of a related crime. And if you take the wrong approach, you'll get something like "I don't know anything about it, shamus!"

So whodunit? I found out, but I'm not telling. On PC's scale of 0 to 6, *The Witness* rates:

FUN	6.0
CHALLENGE	5.0
SOUND/GRAPHICS:	none
TOTAL SCORE:	11.0

FACT FILE

Murder on the Zinderneuf

Electronic Arts, Inc.
2755 Campus Drive
San Mateo, CA 94403
(415) 571-7171

List Price: \$40

Requires: 128K RAM, one disk drive, color graphics adapter, color monitor.

CIRCLE 796 ON READER SERVICE CARD

If the idea of a murder mystery appeals to you but you don't want to imagine your own graphics, *Murder on the Zinderneuf* has both. The game is set in 1936, only 2 years before *The Witness*,



Searching for clues on the *Zinderneuf* is only part of the game.

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PC ARCADE

so much of the atmosphere is similar. But the crime does not take place on Earth.

One of 16 passengers on the luxury dirigible *Zinderneuf* is murdered en route from London to New York, 5,000 feet over the Atlantic Ocean. The air ship is 12 hours away from New York, and it's up to you to gather enough evidence to wring a confession from the guilty party. Otherwise, he or she will go free, and the crime will remain unsolved. Although the 12 hours are simulated, the action of the game is played out in real time, and the *Zinderneuf* will reach New York in 35 minutes. So there is no dilly-dallying over clues as in *The Witness*. Murder on the *Zinderneuf* makes you think on your feet.

Speaking of your feet, they can belong to eight different detective personalities—Miss Agatha Marbles, Lieutenant Cincinnati, Achille Merlot, Chief Inspector Emile Klutzeau, and other thinly disguised caricatures—and each requires a different mastery over the art of interrogation. This challenge plus the random assortment and placement of clues, as well as 16 different suspects and motives, make for an eminently replayable game. You can solve literally thousands of different murders.

The game sets up in a snap. Just turn on the power and wait for the detective menu. Choose whom you want to be, and the game asks if you will use a joystick or a keyboard to move your detective. Answer, and immediately you find your sleuth in the dining room at the bow of the *Zinderneuf*. This room, the observation deck at the stern, the 16 staterooms in between, and two connecting corridors comprise the ship's floor plan.

Using joystick or keyboard, you go to work. Searching the rooms for clues is simply a matter of covering ground. When you run across a clue that you can't see, the game will announce it: "You have found a handkerchief with a monogrammed S." These clues can be called up for review at any time.

However, you are hardly alone on the

PC ARCADE

Zinderneuf. The remaining 15 passengers, all suspect, roam about freely, and you will see them pass in the hallways or encounter them in their room (as well as in rooms there they ought not to be—so keep your eyes open). Unfortunately, it takes quite some time to recognize all the game pieces at a quick glance because the graphics are not very "clean."

The passengers are a varied bunch of high-and-mighty society types whose personalities will keep you amused at the very least. There's the once-divorced and twice-widowed Margaret Vandergilt, a wealthy gossip columnist and patron of my favorite suspect, Vincent Van Wente, who projects himself as "the last of the Italian Futurists." There's the Reverend Jeremiah Folmuth, who got his rest fighting voodoo in the bayous, but now earns in excess of \$100,000 a year.

And what can you make of Hester Pymme, a librarian from Akron who won the trip in a contest? Hmm.

Intense Interrogation

The best part of the game, and what you will spend the majority of your time doing, is questioning the suspects. To talk to someone, you simply bump into his game piece, adopt an attitude from blunt to confused, and select the character you want to ask about. But remember who you are. If you're Charity Flaire, perhaps you should turn on the charm. If you're Harry Hacksaw, perhaps you should eschew all subtlety and go for the jugular. Just don't jump the gun on accusing people of murder without enough evidence—they won't talk to you for the rest of the game.

But given the proper combination of

suspect, attitude, and subject, you can hold someone still long enough to ask questions about three individuals and get lots of good information. And the manner in which the program responds to the questioning of suspects increases the realism of the game. The program checks the person you are speaking to, whom you are talking about, whether that person is alive or dead, male or female, and whether you should be addressed as Miss, Mr., Inspector, or whatever. Ask the wrong things of the wrong persons, though, and they turn their backs on you.

On PC's scales of 0 to 6, *Murder on the Zinderneuf* rates:

FUN	5.5
CHALLENGE	5.5
SOUND/GRAPHICS	4.0
TOTAL SCORE	15.0



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CIRCLE 102 ON READER SERVICE CARD

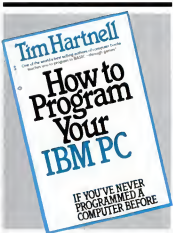
Learning Through Games

Two new books, *How to Program Your IBM PC* and the *Giant Book of Computer Games*, teach you the basics of how to program the PC by writing and playing computer games.

All work and no play makes for dull programming. Or so believes best-selling author Tim Hartnell, who uses dozens of his favorite computer games in *How to Program Your IBM PC* and the *Giant Book of Computer Games* to teach programming on all levels. In both books, his easy-to-follow steps immediately start you off writing and playing games, so you actually have fun while you're learning.

In *How to Program Your IBM PC*, Hartnell takes you on an introductory tour of BASIC program statements. Essentially, he asks you to type the program listings into PC memory, run them, and then study the accompanying text to learn how they run. However, in contrast with other books of this type on the market, Hart-

nell's encourages you to customize his programs' designs and incorporate them into your own programs once you get them up and running.



Error-Free Programs

Rarely, if ever, will you feel stumped while working your way through these programs. Moreover, the program listings have no typos or errors. I ran all the listings without any hitches. And in my experience, this flawlessness is a bit unusual.

Furthermore, the book's size is unimposing: 14 chapters and 3 appendices

in 101 pages. The program listings, including 15 ready-to-play games and 12 general-interest routines, are purposely short: most range from 15 to 40 lines of simple code. The longest program runs 111 lines.

Hartnell assumes that the only software you've used is the packaged type, so he uses the entire first chapter to explain about booting DOS; saving, loading, and naming programs; switching from system mode to BASIC and back; formatting and copying disks; copying, erasing, and renaming files; and calling up directories of files on a disk. Of course, your IBM manuals cover this same material but not in the same compact and usefully organized manner that this book does.

The remaining chapters use game programs and routines to illustrate PRINT and DATA statements, strings, arrays, loops, steps, nests, subroutines, sound, graphics, and so forth—all useful and instructive topics for the novice.

Unique Interest

The games are on par with those in most books of this type, including solitaire, peg-jumping puzzles, reaction tests, MasterMind, dice games, number guessing, and so forth. But the book has just enough unique games to hold the attention of a rabid game player like me. For instance, Hasarni Shogi, Hartnell's ver-



How to Program Your IBM PC: If You've Never Programmed A Computer Before

Tim Hartnell
Ballantine Books, Inc.
201 E. 50th St.
New York, NY 10022
(212) 751-2600

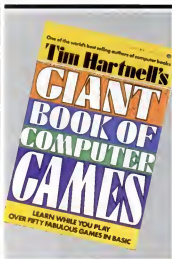
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CIRCLE 725 ON READER SERVICE CARD

BOOK REVIEW

sion of a classic board game from Japan, will entertain the strategist for some time. In *Sound Advice*, you must guess a number, but the computer gives you an audible clue for each guess. The pitch of the clue tells you whether to guess higher or lower. I also liked *Escape from Murky Marsh*, in which a character tries to reach an edge of the gameboard by making random moves. This game is an example of the Brownian Motion Theory, which explains why a drop of ink will eventually spread evenly in a glass of water.

Overall, *How to Program Your IBM PC* teaches you how to use 35 command words from BASIC to create simple games. Obviously, this book is not for readers embarking on a career in programming, but it is for those who have a casual interest in learning how software causes things to happen on a display screen.



Classic Games

In the *Giant Book of Computer Games*, Hartnell presents a similar collection of BASIC program listings and explanations for 52 games, but this book is aimed at intermediate programmers who want to learn more about BASIC and like to collect interesting games.

Almost all computers—from the VIC 20, TRS-80, and Timex Sinclair 2000 to Apple II and IBM PC-compatibles—run these programs, with slight modifications. Fortunately for PC owners, the programs were written on Hartnell's IBM PC. I didn't have time to enter more than half of them because the games are more complex than those in Hartnell's previous book, and the program listings average about 100 lines, with some as long as 500 (how nice it would be if the book were accompanied by a disk with the games already on it!).

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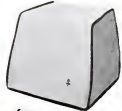
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BOOK REVIEW

But once again, I didn't find any errors or typos in the programs in this book.

The *Giant Book's* games lack graphics and sound effects; they are obviously not arcade games. However, if these limitations don't bother you, the collection is quite wonderful because Hartnell knows just as much about classic games as he does about personal computers.

The *Giant Book* is divided into nine sections, ranging from board games, adventures, simulations, dice and card games, and puzzles to "Fun With Your Printer" and ELIZA, the famous "computer psychiatrist." Needless to say, the variety is fantastic.

Golden Nuggets

I found a couple of real dogs in this collection, however. And some of the programs are common to books of this type. But Hartnell has included enough gold nuggets and originals to make searching through the ore worthwhile. I thought chess and Reversi/Othello were good examples of board-game programming, and I was pleasantly surprised to find the wonderful African counting game, Awari, included. ELIZA is a lot of laughs, particularly when you improvise on the program. Moreover, both programs, Celestia and Billboard, in the chapter entitled "Fun with your Printer" are so interesting that I'd like to see a whole book of them.

Hartnell includes a section on designing your own games as well as a general discussion of programming for each type



*Tim Hartnell's Giant Book of
Computer Games*

Tim Hartnell
Ballantine Books, Inc.
201 East 50th St.
New York, NY 10022
(212) 751-2600

Copyright: 1984
List Price: \$7.95

ISBN: 0-345-31609-6

of game. He encourages you to experiment with his structures, to personalize the games to your own taste, sense of humor, memory capacity, and so on. He even sug-

gests that you send him a game for possible publication in his next book. Best of all, I intend to keep at least ten programs from his book. Not bad for \$7.95. ■

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CIRCLE 228 ON READER SERVICE CARD

Real Investments: Gaining the Edge

The first of this two-part series examines programs that help real estate professionals scrutinize their investments. Written by those in the business, the programs offer practical help.

Software for the real estate professional has appeared in two distinct waves. The first real estate programs were written by programmers, who made many assumptions—not all of them correct—about what real estate professionals needed. The current generation of software, however, has been developed by real estate professionals themselves, and naturally they have taken a more realistic approach to solving problems in their field.

This two-part series reviews five real estate software packages designed to make life easier for agents and brokers. In this issue, we'll discuss programs that aid real estate professionals in examining investments.

Berge Software's Real Estate Asset Management Software System is composed of five application programs: *In-*



vestment Analysis, Acquisitions & Disposition Analysis, Land & Lease Analysis, and Commercial Finance Residential Finance. Each package costs \$595. An optional software subscription service offers ongoing program enhancements, program updates, manual updates, and phone-in consulting.

The service costs \$60 annually per application package and is well worth the cost. The programs are thorough, but they can appear complex at points, especially for the beginner in real estate. That's why a help line is a real plus.

Investment Analysis and Acquisition & Disposition Analysis are starting points. In fact, if you plan to eventually purchase

all five components, it would be a good idea to "convert" your operation over to them one or two at a time.

You can quickly evaluate investment opportunities with an *Income/Expense Analysis* subprogram that is part of *Investment Analysis*. After you enter income, vacancy, credit loss, and operating expense information for a single period of up to 25 years, the program computes gross income, total operating expenses, and net operating income for that period. The result is tied to a detailed cash-flow analysis for financial projections, showing rates of return. The manual not only "walks" you through each step of the process but also gives examples so you will understand it.

Acquiring and disposing of property can mean large gains or losses. The scope of analysis in Berge Software shows there is genius behind the design of these programs. The "exchange recap" function provides a balance sheet for an exchange involving as many as ten "legs," or parties. Another subprogram performs computations on installment sales and alternative offers. The program computes rates of return and present values for any number of cash flows.

The programs are all menu-driven. Program flow charts help explain what is going on and how the programs actually work. Once you are in a program se-

PC

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CIRCLE 246 ON READER SERVICE CARD

BUSINESS

quence, you merely answer a series of questions. You'll find that just about any kind of mortgage calculation is available, from basic to advanced, and that the printed reports are excellent and complete.

Although some aspects of the programs may seem awkward at first, it is mostly a matter of adjusting to the procedures and becoming comfortable with them. These software packages are complete, and, as their high prices would lead you to expect, they do their jobs well.



The Real Estate Consultant Consultant Systems, Inc.

3704 State St., Suite 311
Santa Barbara, CA 93105
(805) 682-8927

List Price: \$275; enhanced version, \$404.

Requires: 64K RAM, one double-sided disk drive.

CIRCLE 782 ON READER SERVICE CARD

Of all the real estate packages I reviewed, *The Real Estate Consultant* came out on top. It is simple to use, its manual sets an excellent example for other companies to follow, and the program handles complex tasks superbly.

In less than 10 minutes you can learn how to use *The Real Estate Consultant*, and if you do have a problem, it's easy to find a solution. The manual's page numbers correspond to the line numbers you see in the program as you respond to prompts. This method is a unique and effective approach to solving the nagging problem of how to find what you need in a manual.

After you make your selection from *The Real Estate Consultant's* main menu, you work with 22 modules or overlays that do everything from amortizations to in-depth cash-flow analysis. Although this program's capabilities are essentially the same as those of the other programs, the package differs in two

ways. First, the program does the complex computations so that you need only input information. The program has built in the theories and formulas so you don't need to know them.

Second, it contains the most complete information on partnerships and syndications of any real estate package on the market today.

A self-training demo disk lets you work your way through a \$2 million syndicated partnership, for example. The demo, which clearly illustrates how easy the program is to use and how effective the information reports will be, is another of the extra touches in *The Real Estate Consultant*. Other such touches are the display of the filename at the bottom of the screen and the program's ability to catch printer error by asking you to check your printer.

Calculations that used to take days when performed manually can now be done in less than 10 seconds using the program. For instance, selecting correct percentage splits of general partners in syndications can take 20 to 30 hours using the old method.



Advanced Real Estate Analyzer Syntax Systems, Inc.

6642 S. 193rd Place, Suite N107
Kent, WA 98032
(206) 251-8438

List Price: \$595

Requires: 128K RAM, two double-sided disk drives.

CIRCLE 781 ON READER SERVICE CARD

Though not as polished as the Berge programs, Syntax Systems' *Advanced Real Estate Analyzer (AREA)* handles a wide range of real estate applications. Syntax, too, offers telephone support for \$100 annually. This all-in-one package literally eliminates the need for a calculator and hand-typed reports.

The program can be used without as much preliminary study as the Berge programs. However, the manual could be

BUSINESS

more helpful. Too often it is assumed that you will know automatically what to do next. If you're a beginner, you could easily get lost. But because **AREA** is menu driven and prompts you with questions, a computer novice should be able to use it just by following the instructions on the screen.

Mortgage information is quite detailed. The program can handle anything from complete amortization data to calculations involving up to ten mortgages with partial-year starts and finishes.

Because **AREA** is menu driven, even a novice should be able to use it.

Analysis projections range up to 20 years. Seven different conventional depreciations schedules, ACRS, or direct depreciation are available, as are before-and after-tax calculations of cash-on-cash. Cash-flow analyses for each year across an entire projected ownership period are impressive and fast. The program's speed allows you to do "what if" modeling merely by changing one or more figures and then recalculating.

A demonstration program package is available for \$50, which allows you to test out the program before buying it. If you decide that you want to buy, the \$50 will be applied to the purchase of the complete package.

Each of these packages takes a very tedious yet important job and lets the PC do the dirty work. Real estate professionals can spend their time on the job at hand: making the best decision based on the information gathered and calculated.

In an upcoming issue I'll take a look at two other programs that approach real estate from a slightly different perspective but still offer tools to make a real estate professional's life easier and more productive. ■

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That's why it's quickly becoming the software that business counts on. Small businesses, Fortune 500 companies, Federal agencies, contractors, wholesalers, and banks across the country, are installing and raving about SOLOMON III. Almost every major accounting firm is placing it on their suggested or recommended list.

The 16 and 32 bit microcomputers of today are naturals for accounting programs ... but not so when they run programs for older genera-

tions of computers ... not so until TLB invested millions to develop the first truly mature and professional accounting software package for microcomputers. SOLOMON III has the accounting features found on large machines coupled with the ease of installation and use you've come to expect from microcomputer software.

The good executive is a skeptic. And computer software claims often promise you the world. However, SOLOMON III is for real. We could list all of the many features of SOLOMON III. But by the time you'd finish reading them, you could have visited an authorized SOLOMON dealer and received an actual demo. So use the electronic coupon and find out who are your closest authorized SOLOMON dealers. We've put in 35 man-years. Why don't you invest a few seconds right now?

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At last there is a program to make your \$3,000 PC behave like a \$125 pocket calculator! For \$39.95, you can make your IBM PC or PC-compatible think it's a Hewlett-Packard 11C programmable pocket calculator.

The concept is not as silly as it might seem. What is silly is sitting at your powerful 16-bit computer and having to reach for a calculator whenever you need to crunch a couple of numbers. David A. Sunderland's *HP-PC* permits you to harness the power of your PC for those mundane calculating tasks that you normally would perform on a calculator. In fact, it goes substantially beyond this, providing a faithful emulation of the functionality and programmability of one of Hewlett-Packard's nicest tools.

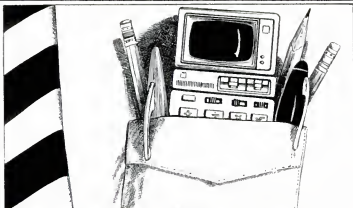
HP-PC

HP-PC Programmable Scientific Calculator, Version 2.1

Sundersoft
1200 S. Catalina #401
Redondo Beach, CA 90277
(213) 540-2567
List Price: \$39.95

Requires: 64K RAM, one disk drive, 80-column screen; 8087 math coprocessor optional.

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Reverse Polish Notation

HP calculators use Reverse Polish Notation (RPN), characterized by the absence of an "equals" key on their keyboards. Instead, it uses the Enter key to push numbers onto a "stack" containing four storage registers. Operations such as the addition or subtraction of two numbers are invoked only after both numbers have been entered. For example, the RPN command

4 ENTER 3 +

is the Hewlett-Packard equivalent of $4 + 3 =$ on an ordinary calculator.

The major justification of RPN is the elimination of parentheses in chained

calculations. The computation

$$(4 + 3) * (8 - 5) = 21$$

takes 12 keystrokes on an algebraic calculator (provided it has parentheses; if not, you may have to write down intermediate results). With RPN, you key in

4 ENTER 3 + 8 ENTER 5 - *

only nine keystrokes. Intermediate results are stored on the stack.

At all times, *HP-PC* displays on screen the four stack registers X, Y, Z, and T (see Figure 1). This makes it easier to grasp the operations of RPN calculation because you see the effect of a command immediately. Most people who

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master RPN would never willingly return to the inefficiencies of algebraic notation. However, *HP-PC* requires you to use the Enter key to invoke commands that would take only a single key press on a calculator (for example, the plus [+]) key for addition). As a consequence, some of the economies of the HP calculator are lost in their translation to the PC.

Pros and Cons

HP-PC is easy for Hewlett-Packard aficionados to use, but it poses significant problems for novices. The typeset user's manual is written in a crisp, straightforward style but is designed for reference only. Only 11 pages long, it gives no examples or sample programs. The only demonstration of *HP-PC*'s capabilities is provided by *BASE-HP*, a program on the *HP-PC* disk that *HP-PC* may use to convert numbers from one base to another.

The only way to learn about the error messages (short of poking into the program with the *Norton Utilities*) is to pro-

voked them. The user's manual does not list them, though its error-trapping appears to be generally good.

An apparently more serious problem appears to be limited to systems with large memories. Some *HP-PC* programs get confused in PCs with more than 512K RAM. *HP-PC* displayed the cryptic error message "NO CORE" and refused to run on my 640K PC unless I first ran either *SuperSpool* or *SuperDrive*, the print buffer and RAM drive utilities that came with my AST SixPakPlus board. Sunderland says that the error was caused by a bug in the Computer Innovations C86 C Compiler with which he wrote the program. The new release of the compiler can handle large memories, and Sunderland offers a recompiled copy of *HP-PC* to those who run into this difficulty.

The manual contains a list matching *HP-11C* keystrokes to the equivalent PC commands. One curiosity is the assignment of part of the Enter function to the caret key (the shifted top-row 6 key) rather than to the Enter key; shift-6 causes a

HP-PC 2.11 RPN Calculator - by D.A. Sunderland 7/30/84

For assistance, type HELP

```

X: 0.0000  Y: 0.0000  Z: 0.0000  T: 0.0000  I: 0  N: 0
4
X: 4.0000  Y: 0.0000  Z: 0.0000  T: 0.0000  I: 0  N: 0
3 +
X: 7.0000  Y: 0.0000  Z: 0.0000  T: 0.0000  I: 0  N: 0
8
X: 8.0000  Y: 7.0000  Z: 0.0000  T: 0.0000  I: 0  N: 0
5 -
X: 3.0000  Y: 7.0000  Z: 0.0000  T: 0.0000  I: 0  N: 0
*
X: 21.0000 Y: 0.0000  Z: 0.0000  T: 0.0000  I: 0  N: 0
sqrt
X: 4.5826  Y: 0.0000  Z: 0.0000  T: 0.0000  I: 0  N: 0
    
```

Figure 1: *HP-PC* keeps the four stack registers—X, Y, Z, and T—on screen at all times.

SCIENCE

copy of the X register to be placed in the Y register, with other stack values being pushed up. There is no reason that the copy function assigned to the caret key

could not be produced by hitting the PC's Enter key. As it is, hitting Enter without having typed in a number or command produces no effect at all.

In addition to using all the commands found on the HP-11C's keyboard, *HP-PC* supports storage of programs and register contents on disk. It takes advantage of the PC's greater memory capacity by offering 100 storage registers versus the 11C's 20, approximately 500 programming instructions versus 63, and a numeric range from +1E-308 to +1E+308 instead of from only +1E-99 to +9.999999999E+99.

Not a Complete Replacement

Will *HP-PC* permit you to put away the calculator you keep by your PC? Unfortunately not—unless you use a multitasking version of DOS. *HP-PC* is not a background program. Unlike Borland International's *Sidekick* or Photon Software's *Tenkey*, *HP-PC* cannot reside in your PC's memory as a companion to other applications programs. To use it you must quit the program you are in, load *HP-PC*, run it, end it, and reload the program you were using.

Sunderland is planning to address this problem. Besides adding the capacity to function with other programs, he intends to enhance *HP-PC*'s features to the level of the HP-15C, the Hewlett-Packard advanced scientific programmable calculator that includes complex variables and matrix functions.

HP-PC is already faster than an HP-15C. The calculator takes 10 seconds to convert the binary number 1001 to decimal 9, while the program takes only 2 seconds. In general, *HP-PC* appears to be four to six times faster than the HP calculator. I would expect the 8087 version of the program, which I did not test, to be several times faster in its calculations.

My collection of four HP calculators is not threatened by the arrival of *HP-PC*. Even the advanced version won't let you slip your PC in your pocket. However, once *HP-PC* can operate in the background, I may be able to free up a bit of workspace. After all, there's something embarrassing about having to keep a calculator next to your PC.

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Matthew Bender, a leading publisher of legal texts and treatises and a subsidiary of the Times Mirror Company, has recently made a solid commitment to the cause of advancing law-office technology. Bender's vice-president, Western Editorial Offices, Pam Sallander, explains, "After lengthy research, we began to see that the means by which legal information was to be delivered to our



customers was fast becoming as important as the information itself." To improve that delivery, Bender has so far developed and released nine specific software systems for four states: *Wills and Trusts*, *Domestic Relations*, and *Corporations* (California and Illinois); *Personal Injury* (California); *Dissolution of Marriage* (New York); and *Family Law* (Texas).

A typical system comprises three parts: legal forms encoded on floppy disks, the *Operator's Manual*, and a wealth of pertinent printed materials in a set of three-ring binders, called the *Attorney's Manual*, including drafting notes, procedural summaries, worksheets,

transmittal sheets, sample documents, and extensive background information on the relevant area of law.

Skeleton Documents

The on-line forms are skeleton documents crafted by Bender's 214 legal writers, copy editors, technical writers, programmers, and operators. Lawyers can view these loosely structured frameworks on-screen or in written form, and then, by choosing from lists of options, they can fill in the content according to the case at hand. Sallander calls this "the building-block approach." It allows small and medium-size firms to customize documents, to match the high quality and proficiency usually reserved for larger firms.

For instance, the New York *Dissolution of Marriage* system contains more than 450 forms on 14 data disks and in the *Attorney's Manual*. It covers such staples as complaints, answers and counterclaims, annulment and separation agreements, interrogatories and other discovery devices, forms for obtaining temporary relief, forms for securing the appointment of guardians *ad litem*, and sundry motions and judgments.

Each prompt represents a gap in the framework of the document, and the program presents a list of predrafted, interchangeable options to fill it. All the



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choices for each issue—such as disposition of the house, child support, and alimony payments—are cataloged on-line, and you select clauses from among these variables (you can also invent your own) as you go through the program. The choices are recorded on transmittal sheets sent to the operator, along with any necessary modifications to the format and other information to be inserted. The assembled document is then dumped into *WordStar*, where you format, edit, paginate, and sculpt it to meet the specifications of the case and the client.

Improved Documents

Bender's method of document drafting has been hailed by many lawyers as a significant improvement: it is swifter, more efficient, and considerably less ex-

pensive than older, traditional methods.

"It's the wave of the future," says Jim Roberts, a partner in the San Jose firm of Roberts & Moore, which uses the California *Corporations* and *Personal Injury* programs. "We're working more and more out of shell documents, and this makes that procedure much easier. Where formerly we would need expert help, now I can do the work myself," says Roberts.

Reve Bautista, an attorney for Hass & Najarian in San Francisco, uses Bender's California *Corporations* system. She particularly likes its ease of operation and efficiency of execution. "Everything is right at your fingertips, and the instructions are simple. It's cutting down on research time tremendously. And the information is periodically updated so we can stay current."

Steele, Levitt & Weiss of San Francisco finds a small disadvantage to running the California *Corporations* and *Wills and Trusts* programs. The firm is somewhat larger than the companies for which these packages were designed, and the software does not fully utilize the firm's sophisticated office equipment, including a \$150,000 computer. The firm is adapting the language of the forms to conform to its own style. In the meantime, however, the "reactions of the attorneys have been very good," says office administrator George Marley, "despite our highly specialized problems with the systems."

James Cameron is the only attorney in Gualala, California. He says that with Legal Systems Software "I can now deliver to a corporate client in half an hour what used to take a day. It allows me to

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produce documents at a much better level than I normally could and do quality work at a low price."

The programs are simple and well organized, so Cameron can delegate work to a secretary or paralegal. And because they are replete with relevant case law, caveats, and commentary and analysis on the ramifications of available clauses, he can save a lot of time and replace many books. "They're packed with law, not just a bunch of forms. They're very practice-oriented."

He particularly likes the programs' organization. "They're menu driven, and the checklists are handy. You can operate on a much classier level and generate such good stuff—extremely fancy work."

Cameron is as enamored of the company as he is of its products. "Bender pub-

lishes the best legal books and forms anyway," he says, "but it's also the nicest software firm I've ever dealt with."

The Question of Cost

The systems cost from \$395 to \$1,700 each, and the *Attorney's Manuals* are

The programs are simple and replete with relevant case law, caveats, and commentary.

available separately for \$795 each. Since Cameron's system is carefully customized, it cost him close to \$2,000. He pays for his systems through monthly install-

ments of \$125 (the monthly bill for one program would be about \$55). "Bender gets top dollar," Cameron says, "but the programs always manage to pay for themselves."

Bender refines and improves the programs whenever possible. Next year, the packages will include a merge function, will be able to establish data files, and may even be accessible to multi-user systems. When UNIX's market share becomes more substantial, the company plans to make its programs compatible with that operating system.

"We're also expanding both the depths of the product lines and the states covered," says Sallander. *Real Estate* and *Probate* for California and *Wills and Trusts* and *Corporations* for Texas will be the next releases, and many more are scheduled to follow. ■

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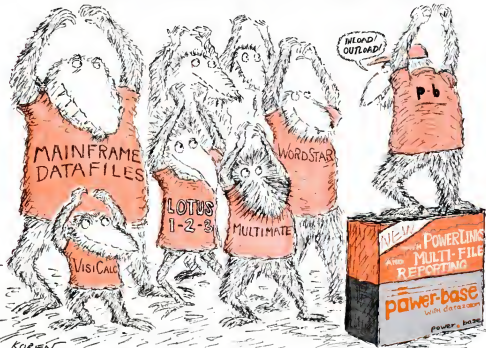
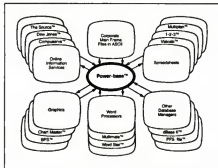
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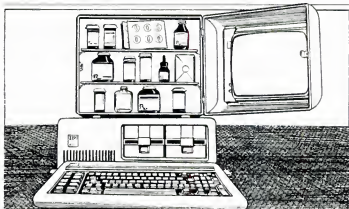


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Find It with MINET

GTE's on-line medical database, MINET, is a comprehensive resource on drugs and over 3,500 diseases, but you should search elsewhere to access current medical literature.



GTE Telenet, in conjunction with the American Medical Association, offers an on-line database for the medical profession called MINET. With GTE's experience in computers and electronics and the AMA's knowledge of doctors and medicine, you'd expect a superb package. But, like the man who crossed the radish with the cabbage to produce the ideal edible plant, this marriage isn't as fruitful as you might hope.

MINET vs. BRS

Eight months ago, I bought MINET to access current medical literature. And at least once each month I consider cancel-

ing my subscription. Instead of using Medline and the National Library of Medicine as information sources, MINET uses a subset of the *Excerpta Medica*. My searches often turn up no references on a given subject, although I can find the references in the *Index Medicus* or on Medline.

I performed the same searches on MINET that I did on Medline using the Bibliographic Retrieval Service (BRS): nurse burnout in intensive care units and hematuria in joggers. (see "A 22-Hour Library Card," *PC*, Volume 3 Number 24). A 15-to-20 minute search for "intensive care" resulted in 134 references. Only a few were related to burnout, and I

had to shuffle through a display of the first lines of all 134 before I learned that the right key word was "stress." Entering "hematuria" returned 70 references, only one of which was related to jogging. My BRS/Medline searches were far more satisfying.

These unproductive searches are particularly frustrating because they are expensive: the minimum cost per month for the service is \$45, which is high, as are the hourly fees. Since there's no GTE node where I live, I also have additional phone charges from AT&T.

Some of the complaints I have about BRS apply to MINET as well. You can't change from screen-by-screen display to



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Rates: Initial fee, \$100. \$45 per month for minimum usage. Hourly rates: clinical literature database, \$39; drug database, \$27; disease database, \$26; continuing education, \$25 (7 a.m. to 6 p.m.) and \$22 (6 p.m. to 7 a.m.). Each additional password, \$25.

CIRCLE 784 ON READER SERVICE CARD

Printer Switch for IBM PC Computer

MFJ-1248
\$ 99 95

Share a parallel printer between 2 IBM PCs with the push of a button. Eliminate trouble and confusion caused by plugging and unplugging cables. Save the cost of a second printer.

Quality printed circuit board construction gives maximum reliability and eliminates wiring, cross-talk and line interference. Features same type connectors as PC parallel printer port, 8x26 in.

Centronics Parallel Printer Switch

MFJ-1249
\$ 99 95 2 inputs, 1 output. Push button switches. Female Centronics connectors. Printed circuit board construction. 10 1/2x26 in.

Multi-function RS-232 Switches

MFJ-1240
\$ 79 95
Choice of 8 models

Multi-function RS-232 transfer switches let you switch your computer among printers, modems, terminals, any RS-232 peripherals, monitor data/line failure, protect data lines from surges, and use as null modem for less cost than a switch alone.

Switches: 10 lines (2, 3, 4, 5, 6, 8, 11, 15, 17, 20) LED data/line indicators monitor lines 2, 3, 4, 5, 6, 8, 20. Metal oxide varistors protect data lines 2, 3 from voltage spikes and surges. Push button reverses transmit-receive lines (2, 3). PC board eliminates wiring, cross-talk, line interference. Connects any one input to any one output.

Model	Price	In	Out	Model	Price	In	Out
MFJ-1240	\$99.95	1	2	MFJ-1241	\$109.95	3	3
MFJ-1241	\$99.95	2	2	MFJ-1242	\$109.95	4	4
MFJ-1242	\$109.95	2	3	MFJ-1243	\$109.95	1	2
MFJ-1243	\$119.95	1	4	MFJ-1247	\$99.95	1	2

Switches 20 lines

AC Power Centers

MFJ-1108 MFJ-1108, \$99.95. Add convenience, prevent data loss, head bounce, equipment damage. Relay

latches power off during power transients. Multi-filters isolate equipment, eliminate interaction, noise, hash. MOVs suppress spikes, surges. 3 isolated, switched socketpairs. One unswitched for clock, etc. Lighted power reset switch. Pop out fuse 3 wire, 6 ft cord 15A, 125V. 1875 watts. Aluminum case Black 18x21x2 in. MFJ-1107, \$79.95. Like 1108 less relay. 8 sockets, 2 unswitched. MFJ-1109, \$129.95. Like 1107 but intelligent. Switch on device, plugged into control socket and everything else turns on. Others available.

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Call 601-323-5859 in Miss. outside continental U.S., tech/repair info. Telex 53-4590 MFJ STKV

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MFJ ENTERPRISES INCORPORATED

921 Louisville Rd., Starkville, MS 39759

MEDICINE

continuous output and back unless you stop just short of logging off and logging on again. The system doesn't automatically search for synonyms, nor is it easy to guess which ones the system knows.

You must also become familiar with system syntax before you can search a topic. MINET requires that you specify the segment of a reference (subject, title, or author) in which to search for the term you enter, as well as an operator such as "find" or "index."

MINET's screen display has a few advantages. You choose the database you'd like to search from a series of convenient menus. Once you've collected 134 references, you can choose which ones you'd like to display by scanning the first lines of each title a screenful at a time and then specifying those you're interested in.

Why do I stick it out with MINET? Because its services are unavailable elsewhere, and they offer the only alternative to carrying around a *Physicians Desk Reference*, a pharmacology text, and a brief synopsis of the signs and symptoms of 3,500 diseases.

Comprehensive Databases

The DRUG database allows you to request information about medications using the generic name, trade name, use, adverse reaction, toxicity, or interaction. For example, by typing "use-migraine," you can obtain complete prescription information on drugs used for the treatment of migraine headaches. You can also display only selected topics about a drug, such as dosage or precautions in use. Yet another feature is a drug information printout for patients, prepared by the AMA.

In addition, several pharmaceutical companies have provided funding to access an electronic analogue of the *Physicians Desk Reference*, called PHYCOM, to complement the drug database. The database is as comprehensive as the *PDR*, which most health-care professionals rely on periodically.

The DISEASE database allows you to

obtain a brief summary of the cause, symptoms, physical findings, lab data, and natural course associated with over 3,500 diseases. The data isn't as comprehensive as that in *Harrison's Textbook of Internal Medicine*, but it is a nice, quick review. An undocumented function allows you to enter a symptom, sign, or combination of these to produce a suggested illness. The organizations associated with the service do not suggest this use, and I don't recommend relying on it for a diagnosis, but it does serve as a nice *aide-memoire*.

Another useful on-line service is a bulletin board of continuing medical education courses. However, a much more valuable service lets you take continuing medical education courses provided by the Massachusetts General Hospital (read Harvard Medical School) in your spare time. The courses consist of case presentations during which the participating physician is prompted to enter diagnostic tests and possible treatments in response to the case. Multiple-choice questions are presented too.

Several other services are less useful. These include a listing of the AMA's current procedures and terminology; a classification system for insurance billing; a current socioeconomic literature database; and MED/MAIL, a mail service linked to GTE's TELEMAL, which permits user-to-user communications but which doesn't support hard copy transmission or transmissions to nonsubscribers.

A Good Prognosis

The reason that I didn't drop my subscription this month stems from a conversation I had with MINET's director, Marilyn Bardsley. She and her staff are aware of the deficiencies of the system, and they've embarked on a multimillion-dollar campaign to upgrade existing services and add new ones that sound to me like medicine/computer heaven. These should be implemented over the coming year, and I can't wait.

Learn Lotus™ 1-2-3™ quickly and easily.

You can learn on your own computer at your own pace in hours instead of days for under \$70.

Cdex™ Sudden Knowledge™ Training Programs turn your personal computer into your personal tutor. The following programs are available to train you on how to effectively utilize Lotus 1-2-3.

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- Lotus 1-2-3 as a database
- Creating and printing graphs
- Constructing keyboard macros
- Programming Lotus 1-2-3

Teach Yourself the Lotus 1-2-3 Program (First time users)

- Moving the cursor
- Entering and using labels
- Saving, loading and printing a worksheet
- Creating and copying formulas
- Displaying data graphically

Cdex also provides six business application training programs that turn Lotus 1-2-3 and Symphony™ into indispensable management tools.

- Managing Your Business Using Lotus 1-2-3/Symphony
- Making Key Business Decisions Using Lotus 1-2-3/Symphony
- Analyzing Financial Statements Using Lotus 1-2-3/Symphony
- Building a Business Plan Using Lotus 1-2-3/Symphony
- Analyzing Sales Performance Using Lotus 1-2-3/Symphony
- Analyzing Business Investment Opportunities Using Lotus 1-2-3/Symphony

Each of the above programs provides a combination of tutorial information and Lotus 1-2-3 or Symphony templates to help you apply spreadsheet analysis to the particular subject matter.

Cdex offers over 50 programs to learn *how to use* and *how to apply* the most popular personal computers and personal computer software. Most programs run on the IBM PC, PC/XT, PC/AT or PCjr., the Apple II family and TI Professional computers. Sudden Knowledge Training Programs are available nationally at most retail computer stores.

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AT, 1 QD/20MB, 512K	5395
PORTABLE, 2 DSDD, 256K	2214

COLUMBIA

PC, 2 DSDD, 128K	1890
XT, 1 DSDD/10MB, 128K	3164
PORTABLE, 2 DSDD, 128K	2030

TELEVIDEO

PC, 2 DSDD, 256K	1960
PC, 2 DSDD, 256K, COLOR	2263
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New On The Market

HARDWARE

RASCOL Printer Controller

A color graphics printer controller based upon the Motorola 68000 16/32-bit microprocessor. The standalone controller, linked to the user's system either through an RS-232 serial or Centronics parallel port, accepts graphics primitives output from a Lasergraphics software driver installed in the user's system. It rasterizes this data to produce millions of color dots reproducible by a range of laser, thermal, and ink jet printers, as well as by digital film recorders.

The RASCOL controller offers six standard fonts that range from 6 to 30 points in size. Other standard features include zoom, image rotation, and image overlays. When not being used to generate images, the device serves as a 200K print buffer.

The device can be ordered with up to 512K of dedicated RAM used as a buffer. When the buffer is

filled by output from the user's system, XON/XOFF and DTR signals control additional output.

Lasergraphics software drivers—which convert the output of a graphics program to Lasergraphics language acceptable to the RASCOL controller—are available for a number of popular programs, including Lotus's 1-2-3. The drivers are designed to free the user's system for other applications as soon as the image data has been transferred to the RASCOL's buffer memory.

(List Price: \$1,995)
Lasergraphics, Inc.
17671 Cowan Ave.
Irvine, CA 92714
(714) 660-9497
Telex: 75-3527

CIRCLE 663 ON READER SERVICE CARD

Fastest-80 Printer

A dot matrix printer offering a printing speed of 80 characters per second, six-pitch capability, bi-directional printing, a line buffer, friction feed, self-test switch, and a Centronics parallel interface. The printer uses a



Fastest-80 Printer, Smith-Corona

drop-in ribbon cassette rated at 1 million characters. (List Price: \$259)
Smith-Corona
65 Locust Ave.
New Canaan, CT 06840
(203) 972-1471

CIRCLE 667 ON READER SERVICE CARD

EXECUPORT 1230

A dot matrix printer with a built-in 300/1,200-bps intelligent modem. Somewhat compatible with Epson graphics, the EXECUPORT includes both serial and parallel printer interfaces and Mite Communications software.

The print speed is rated at 240 characters per second, with a dot resolution of 240 dots per square inch. The printer offers a 1K buffer, with a 7K to 15K option. Both fanfold and roll paper with top form sensing can be used. It measures 13 x 4 3/4 x 6 inches.

and weighs 10 pounds.

The internal modem is Bell 212/103-compatible and is capable of autoanswer.

(List Price: \$1,380)
Computer Transceiver Systems
P.O. Box 15
East 66 Midland Ave.
Paramus, NJ 07652
(201) 261-6800

CIRCLE 637 ON READER SERVICE CARD

PCturbo-186

An Intel 80186 coprocessor card that runs a full 16-bit data path and includes RAMdisk, disk-caching, and print-spooling software. The PCturbo-186 permits concurrent processing of applications on the 80186 chip and I/O on the IBM's 8088 processor. The main card comes with 128K of RAM, expandable to 256K; there is also an optional add-on board with 128K RAM, expandable to 384K.



RASCOL Printer Controller, Lasergraphics, Inc.

HARDWARE

(List Price: \$1,095; option, \$265)

Orchid Technology
47790 Westinghouse Dr.
Fremont, CA 94539
(415) 490-8586
Telex: 70-9289

CIRCLE 633 ON READER
SERVICE CARD

Asher

A multiline voice and data communications board with an internal 300-baud modem, a telephone handset, and proprietary software. Features include TouchTone/pulse dialing with detection, line status monitoring, single-key feature access, and two-line operation. The Asher board can also be used with PBX, supporting such features as conference calling, call transfer, call forward, pick up, and redial.

Asher software includes a memory partitioning feature that allows a user to switch at will between any of up to nine applications programs depending upon the amount of memory in a user's system (64K mini-

mum for each partition). Asher also includes an appointment scheduler with tickler, a telephone directory, and a card file management system.

The directory and card files allow up to 250 records each. Multiple searches and sorts are permitted, and context-related prompts and on-screen help messages are also available on command.

(List Price: \$695)
Requires: 128K RAM,
one disk drive, PC-DOS.
Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
(404) 923-6666

CIRCLE 658 ON READER
SERVICE CARD

OMNI-READER

A handheld optical character reader capable of scanning a typewritten line on a page of printed text within 3 seconds and entering the data into the IBM PC's memory. Although the unit recognizes four fonts—Courier 10 and 12, Letter



Asher, Quadram Corp.



SILO/PCX, Upland Technologies

Gothic, and Prestige Elite—other fonts can be downloaded by the user.

The OMNI-READER consists of two moving parts: a precision-read head and a manual tracking guide. Operation consists of depressing the read button for scanning a line of text and releasing it for processing and displaying the data. A second button inserts carriage returns and blank lines.

The OMNI-READER connects to the RS-232 serial port and is configured as a modem with XON/XOFF protocol. Baud rates are switch selectable from 300 to 9,600 bps. The unit measures $4.8 \times 10.7 \times 7.4$ inches and weighs $4\frac{1}{2}$ pounds with power supply. (List Price: \$499)

Oberon International
5525 MacArthur Blvd.
#630
Irving, TX 75038
(214) 257-0097

CIRCLE 635 ON READER
SERVICE CARD

SILO/PCX

A $\frac{1}{4}$ -inch cartridge tape subsystem with a half-size interface card, which provides storage for 67 MB of formatted data and can be used for backup, auxiliary on-line storage, and removable archival storage.

The data cartridge is formatted to appear as four sequential diskette volumes with a 16.7-MB capacity each. With the accompanying software package, the SILO/PCX appears as another drive to the IBM PC. The software also supports DOS commands, formats and certifies the tape, verifies data, and unloads without host computer intervention.

The single-track, single-gap precision stepping head uses 19 increments to step between each of 16 tracks, providing a track alignment error of less than 0.002. A correction of a dropout up to 256 bytes in length is possible through the use of 1,024 bytes in four frames plus two addi-

HARDWARE

tional frames. A Data Certify command maps out any block with a single dropout, regardless of its correctness.

The SILO/PCX also features an autoloop sequence that rewinds the inserted tape and performs an automatic self-test and head-to-tape edge alignment test to ensure data interchange.

The unit reads, writes, and verifies 35,000 bytes per second at 60 ips and loads 600 feet in 80 seconds at 90 ips. It measures 9 x 5 x 15 inches.

(List Price: \$2,195)

Upland Technologies

80 Davids Dr.

Hanappage, NY 11788

(516) 231-0770

Telex: 70-4309

CIRCLE 773 ON READER
SERVICE CARD

72-MB QuadDisk

An internally mounted Winchester hard disk offering two partitions of 31 megabytes for a total formatted storage capacity of 72 MB. The 72-MB

QuadDisk has an average access time of 30 milliseconds and uses PC-DOS 2.0 or 2.1 commands for formatting, copying, backup, etc. The drive can boot directly into the user's system without requiring external device drivers. Included with the 72-MB QuadDisk is *Wonder* software, a menu-driven utility for accessing DOS

commands and executing programs. The utility allows the user to position the screen cursor on the name of the program to be opened. All DOS commands can be executed with single keystrokes.

The unit package includes the drive, controller card, separate power supply, and software.

(List Price: \$6,500)

Quadram Corp.

4355 International Blvd.

Norcross, GA 30093

(404) 923-6666

CIRCLE 668 ON READER
SERVICE CARD

RAMDISK-1M

A half-size, single-board RAMdisk emulator with 64K built-in. It is expandable to 1 MB, in 64K in-

crements. The RAMdisk formats in 512-byte sectors, providing 128 sectors for 64K and 2,048 sectors for 1 MB of storage. There is also an optional dedicated power backup module in case of accidental power loss.

(List Price: \$315)

DATAPLUS

6118 Chesebro Rd.

Agoura Hills, CA 91301

(818) 706-1319

CIRCLE 638 ON READER
SERVICE CARD

ColorPAK

A high-resolution color graphics board offering extended graphics, configurability, and expandability. The board also comes with *Grafix*

Partner, a presentation graphics utility that enhances graphics generated by applications programs.

ColorPAK can be configured to five different display modes. When used with a high-resolution monitor such as the Princeton Graphics SR-12, the board provides a non-interlaced, four-color 640 x 400 resolution graphics display; its text screen offers 80 characters by 50 lines. When used with the IBM Color Monitor, the board can be configured for either 640 x 200 graphics resolution (16, 4, or 2 color), or 320 x 200 graphics resolution and an 80 x 25 screen display.

The ColorPAK is Plantronics-compatible in



72-MB QuadDisk, Quadram Corp.

HARDWARE

640 x 200, four-color mode. It can be expanded with either UltraDISK, a disk controller, or UltraRAM, a 64K to 384K piggyback card. A SoftPAK option, for virtually 100 percent IBM software compatibility, is also available. (List Price: \$580; SoftPAK option, \$99)
TSENG Laboratories, Inc.
205 Pheasant Run
Newtown, PA 18940
(215) 968-0502

CIRCLE 636 ON READER
SERVICE CARD

AT&T Model 4000

An intelligent Bell 212A modem with programmed firmware allowing the user to access all control features either directly from the keyboard or through a separate communications program. The firmware provides the user with one-keystroke command summary screens; also, 11 preprogrammed internal settings that determine the modem's operational features can be easily reconfigured by the user at the keyboard or through the software.

The AT&T Model 4000 modem includes five diagnostic tests that permit the verification of correct operation and data transfers. It can transfer data at either 0 to 300 or 1,200 bps in full-duplex serial asynchronous operation, with Touch-Tone or pulse dialing.

(List Price: \$499.95)
AT&T Consumer Products
5 Wood Hollow Rd.
Parsippany, NJ 07054
(201) 581-5185

CIRCLE 666 ON READER
SERVICE CARD

STOPLOCK IIR

A programmable circuit board providing the user's system with protection against unauthorized entry. Up to 15 access codes and one master ID code can be programmed and encrypted by the user.

The menu-driven firmware features three programs: *SOFTHOLD*, which locks the computer and display at any point, returning the system to normal operation with the ID code; *AUTOTRAIL*, which records actual and attempted accesses; and

STOPDISK, which protects DOS diskettes so that they are accessible only by the user on the user's own system. The user may list, add, and delete both active and inactive ID codes.

(List Price: \$495)
Quest IV Industries
901 Kentucky, #304
Lawrence, KS 66044
(800) 255-0524
(913) 842-7815

CIRCLE 771 ON READER
SERVICE CARD

Unite Series

A series of five UNIX-based local area network servers that support from 1 to 32 IBM PC users. The units are based on Motorola's MC68000 processor, Multibus architecture, and AT&T's *UNIX System V*. Each of the units provide shared disk

and peripheral resources, centralized data files, remote disk access, print spooling, and password protection of personal files. They also offer a variety of disk options and software-selectable bps rates, access via modem, and support for intelligent and dumb terminals.

Each unit includes a 10-MHz MC68000 micro-processor with 256K no-wait-state memory with parity, expandable to 512K. The Unite II supports 1 user; the Unite 4i, up to 4 users. Both are expandable to 1.5 MB total, including CPU RAM, and have 40 MB of disk storage.

The Unite 8i has up to 2.5 MB of RAM and 108 MB of disk storage; it supports up to 8 users. The Unite 16i doubles that user support and offers up to 4.5 MB of RAM and up to 168 MB of disk storage. The largest model, Unite 32i, is capable of supporting as many as 32 users with 8.5 MB of RAM and 1,896 MB of disk storage. (List Price: from \$9,000 to over \$35,000)

Requires: 192K RAM, one disk drive, PC-DOS, serial I/O port.
CYB Systems Inc.
6448 Hwy. 290 E., D-111
Austin, TX 78723
(512) 458-3224

CIRCLE 634 ON READER
SERVICE CARD



AT&T Model 4000, AT&T Consumer Products

Scooter Multi-Buffer

A print buffer that accepts input from three PCs without manual switching. It features a 64K memory, built-in power supply, and front-panel indicators that include an LED Bar Graph memory usage meter, a pause switch, a copy switch for reprinting any current data segment, and a reset switch to clear RAM.

(List Price: \$389)

ohm/electronics

746 Vermont

Palatine, IL 60067

(312) 359-6040

CIRCLE 664 ON READER
SERVICE CARD

SOFTWARE**CAD MASTER**

A two-dimensional color drafting program for high-resolution computer-aided design. It can be applied to design work in mechanical, architectural, and schematic drafting, as well as for electrical/electronic circuit design. Drawings are created with macro commands, the cursor, a mouse, or a digitizing tablet.

CAD MASTER features auto-dimensioning for locating dimensions within, above, or below lines, with automatic drawing of reference lines and arrows; 130 assignable layers per drawing, which can be manipu-

lated for clarifying the drawing or speeding the redraw; fillet and mirror radii generation; and user-definable symbol tables and parts libraries. It also offers multiple-pattern fills and cross-hatching, eight line styles, and 16 text sizes in a variety of fonts.

Engineering functions include area and volume computation, centers of gravity, and moments of inertia. **CAD MASTER** supports the Intel 8087 math coprocessor. An auto-remap feature rescales the drawing for output to dot matrix printers or plotters. An optional billing of materials module is also available.

(List Price: \$1,795)

Requires: 256K RAM, two disk drives, PC-DOS, color monitor, color/graphics adapter, asynchronous adapter, digitizing input device.

Datagraphics Systems

7011 Biscayne

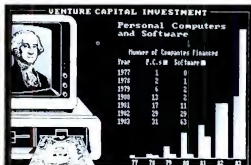
Milford, MI 48042

(313) 451-7031

CIRCLE 655 ON READER
SERVICE CARD

Account Manager

A menu-driven database program designed specifically to provide sales managers and reps with detailed account profiles. It creates and maintains individual account profiles with up to 19 screens of information. **Account Man-**



EV Capture Plus, Visual Communications Network, Inc.

ager also produces a number of summary activity reports.

With **Account Manager**, the user can keep track of the following data for each account: local account address, regional and national headquarters, and additional location data; client personnel lists; sales history; account buying process; sales opportunities and strategy; competitor's sales activity; benefits of sales rep's solutions; and all planned activities.

The user can generate a weekly activity planner, a contact log, and sales forecast reports for all or selected groups of accounts.

(List Price: \$295)

Requires: 256K RAM, two disk drives, PC-DOS. *Systec Resources Corp.*
4324 Promenade Way
Marina del Rey, CA 90292
(213) 823-5800

CIRCLE 650 ON READER
SERVICE CARD

EV Capture Plus

A utility program providing a graphics interface between various applications programs and color printers/plotters. **EV Capture Plus** also allows images generated by other programs to be captured for enhancement by the **VCN ExecuVision** presentation graphics program.

EV Capture Plus can be called at any point during a program's operation. The screen image captured can be printed immediately or stored to disk in **VCN ExecuVision** format for enhancement with images from the **VCN** graphics libraries. Control is returned to the applications program at the point where the program was left.

Among the applications programs **EV Capture Plus** can work with are *Lotus's 1-2-3* and *Symphony*, *Charman*, and *WordStar*. It drives the following color printers and plotters:

SOFTWARE

IBM Color Printer, IDS Prism, Hewlett-Packard plotters, Quadram Quadjet, Epsoms with Grafrax, and Xerox Diablo Inkjet. (List Price: \$125)

Requires: 34K RAM, one disk drive, PC-DOS, color monitor, color/graphics adapter.

Visual Communications Network, Inc.
238 Main St.
Cambridge, MA 02142
(617) 497-4000

CIRCLE 667 ON READER SERVICE CARD

PagePlanner

A page make-up program that interfaces to a number of typesetting and photo-composition systems. It permits the on-screen display of such page design elements as solid blocks of type, ruled lines, and protected areas. The built-in text editor allows the merging of text with typesetting coding structures.

The software consists of four modules: one for text entry and editing, another for hyphenation and justification, a third for page make-up, and the last for driving the typesetting equipment.

The on-screen display includes several status fields in which the user can have the system show such page information as the number of keystrokes, the file and edition identifiers, and page numbers.

The total depth of a page file is displayed in points and inches. Other features include block moves and deletions of character, word, line, sentence, or complete blocks of text.

PagePlanner also contains a 5,000-entry prefix and suffix table, and a user-definable 500-typeface kerning-pair table. The hyphenation module is based on algorithms following accepted rules. The page make-up module allows more than one text file to be included in a page file, provides for horizontal and vertical ruling commands, and allows page areas to be delineated for line and screen work insertion.

PagePlanner, which can import *WordStar* and *XyWrite* text files, works with a number of typesetter drivers. Interfacing through the IBM PC's parallel printer port, typesetter modules are available that can drive the Mergenthaler 101, 202, and 202N+W, the CompuGraphic 8400 and 8600, and the Mono-type Lasercomp.

(List Price: \$2,995; typesetter driver, \$395)
Requires: 256K RAM, two disk drives, PC-DOS, graphics card.

Westminster Software
660 Hansen Way #2
Palo Alto, CA 94304
(415) 424-8300

CIRCLE 663 ON READER SERVICE CARD

Tax 1040

A tax preparation program for accountants, capable of producing finished IRS 1040 forms at rates up to five returns per minute. It streamlines the entire return-processing procedure, producing attachments and schedule forms as needed. Data entry is accomplished by following 1040 form line numbers; a self-paced, on-line tutorial system enables the user to learn the program easily.

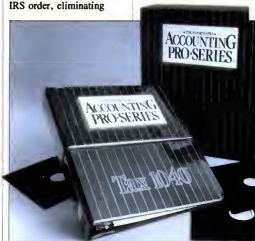
Tax 1040 allows the user to indicate which forms and schedules to print during a rerun, permitting changes to be made rapidly on only those forms affected. After the returns are processed, each client's tax return and schedules are printed in IRS order, eliminating

time-consuming collating. Printing may be done on continuous, IRS-approved facsimile forms, allowing unattended printing.

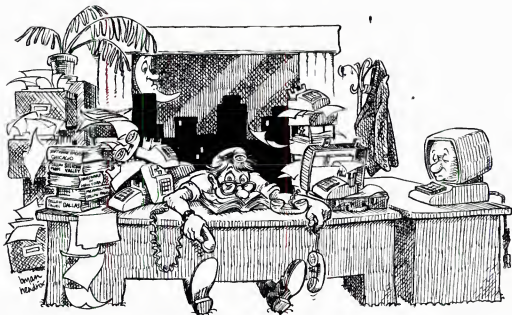
Add-on software modules are also available for preparing state tax forms from the same data. (List Price: Federal forms, \$2,500; add-on state form modules, \$400-\$700)
Requires: 192K RAM, 10-MB hard disk, PC-DOS.

Management Control Systems Division
Informatics General Corp.
2400 Lake Park Dr.
P.O. Box 72-3597
Atlanta, GA 30339
(800) 241-3306
(800) 282-4170 in GA
(404) 432-1996

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Tax 1040, Management Control Systems Div.



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T457

SOFTWARE

WIRELIST

A program for managing all aspects of wire-wrapping prototype circuit boards. Using a standard editor, such as EDLIN or WordStar, the user creates a file containing all of the information needed to describe the location of each component on the wire-wrap board, the type of components used, and the logical connections between the components (from the schematic diagram). *WIRELIST* produces a graphic display of each wire string, showing the optimum routing across the board. It also produces wiring lists, showing com-

ponent wiring order in terms of efficient levels.

Through interactive editing in *WIRELIST*, the user can add or delete connections, or change the displayed routing of a wire string. Design aids that come with the software include a wire string endpoint for diagnostic testing; a master cross reference that lists all connections to every component and pin on a board; and diagnostic reports, including lists of duplicate pins and isolated pins, parts lists, and other component reference lists.

Other features of the software include user-definable macros and a con-

venient shorthand notation for the entry of wire strings; sorted listing of wire lengths needed, based on either point-to-point or "right-angle" routing of wires; and an adjustable scale factor, allowing a positional accuracy of up to .001 inches for component pins.

(List Price: \$149)

Requires: 128K RAM, one disk drive, PC-DOS 2.1, color/graphics adapter, ASCII file editor.

Starbow Software
10403 Caminito Canyon
San Diego, CA 92131
(619) 578-4893

CIRCLE 778 ON READER
SERVICE CARD

folio transaction from contact name and date of purchase through sale, producing net gain and loss reports.

(List Price: \$89.95)

Requires: 128K RAM, one disk drive, PC-DOS.
Superex Home Software
151 Ludlow St.
Yonkers, NY 10705
(800) 862-8800
(914) 964-5200
Telex 13-1584

CIRCLE 654 ON READER
SERVICE CARD

MI-AMOR

A program for amortizing and computing loans without resorting to a spreadsheet. It calculates payment, principal, rate or term, and produces amortization schedules. It also permits customized headings, balloon loans, interest-only payments, and negative amortizing.

MI-AMOR can accept entries in up to trillion-dollar amounts and has 14-digit accuracy. Print format options include check number and date-paid columns, page length, left margin offset, line spacing, and automatic and manual paging.

(List Price: \$89.95)

Requires: 128K RAM, one disk drive, PC-DOS.
Budget Computer, Inc.
P.O. Box 818
Golden, CA 80402
(303) 277-1505

CIRCLE 656 ON READER
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Home Executive

A home-oriented productivity program that includes nine programs for maintaining a 3,000-record address book, an appointment book and calendar, a checkbook, a collector's list, a household inventory, a gift list, and an investment portfolio.

The financial analyst module enables the user to determine monthly payments on a fixed-rate loan or mortgage, calculate compounding interest in a monthly deposit account, plan the initial investment necessary for retirement accounts, and calculate the future value of an initial investment. The *Home Executive* also tracks a port-



Home Executive, Superex Home Software

F77L, FORTRAN-77 Language System

An implementation of the ANSI FORTRAN-77 standard. The language includes the following features: recursion; IEEE standard floating-point arithmetic; four types, including LOGICAL*1, INTEGER*2, REAL*8, and COMPLEX*16; and break handling. F77L also provides optional checking of subscript, subprogram class, argument and alternate return count, and features such as the dollar sign (\$) in a name, up to eight characters in a name, and initialization in type statements.

The language also supplies execution error messages that include text and a subprogram/line-number traceback, over 165 compile-time English-language diagnostics, and a free-format source file where comments begin with an asterisk and continuation lines with an ampersand. It supports subprograms as large as 64K and offers Lattice C execution-time compatibility. Two of the CHARACTER argument functions are CHARNB, which returns CHARACTER value with no trailing blanks, and NBLANK, which returns the number of the last blank character.

The system comes with a 250-page tabbed manual and includes 13 chapters, 6

appendixes, and an index. A newsletter and phone service are also available. (List Price: \$477)

Requires: 256K RAM, one disk drive, 8087 math coprocessor.
Lahey Computer Systems, Inc.
904 Silver Spur Rd., #417
Rolling Hills Ests., CA 90274
(213) 541-1200

CIRCLE 775 ON READER SERVICE CARD

ACCESSORIES**Floppyclene Cleaning Kit**

A wet/dry disk head cleaning system. Each kit includes 20 disposable cleaning disks, the Safeclene

aerosol cleaning solution, a disk jacket, and absorbent surface and screen wipes. (List Price: \$19.95; refill kits, \$14.95)

Automation Facilities Corp.
P.O. Box 06346
Columbus, OH 43206
(614) 221-4201

CIRCLE 661 ON READER SERVICE CARD

Compucart

A movable computer workstation featuring a tambour door, two sliding shelves, and enough storage area for a complete system including modems and printer paper. The entire unit can be closed and locked for security.

The Compucart also provides a rear swing-down door for cabling access,

adjustable storage space for manuals and software, horizontal and vertical adjustments at the keyboard level, and room for a 132-column printer. The unit has a footprint of 4 square feet and rolls on 2-3/4-inch twin-wheel casters. It is available in four plastic laminated finishes: Almond, English Oak, Natural Oak, and Walnut. (List Price: \$595)

Versa Tec Corp.
201 N. Rome Ave.
P.O. Box 2095
Tampa, FL 33601-2095
(800) 237-9024
(813) 251-2431

CIRCLE 774 ON READER SERVICE CARD

IN-LINE Power Cord

A replacement power cord offering built-in surge and spike suppressing and EMI/RFI noise-filtering circuitry. The unit features three-stage suppression and filtering networks that work independently. Total length of the cord is 7 feet, and it fits any standard CEE-22 computer power jack.

(List Price: \$44.95)
Kalglo Electronics Co., Inc.
6584 Ruch Rd.,
E. Allen Twp.
Bethlehem, PA 18017
(215) 837-0700
TWX: 510-651-2101

CIRCLE 665 ON READER SERVICE CARD



Floppyclene Cleaning Kit, Automation Facilities Corp.

T200 Tilt/Swivel Monitor Base

A monitor base that tilts and/or swivels to accommodate the user. The accessory turns a full 360 degrees and tilts from +12½ degrees to -12½ degrees. The foam-covered metal plates are joined at a ball-bearing turntable mount. The monitor is held in place by a raised lip on the top plate; the bottom plate is equipped with mounting feet and a built-in pen and pencil holder.

(List Price: \$29.95)
Computer Accessories Corp.
7696 Formula Pl.
San Diego, CA 92121
(619) 695-3773

CIRCLE 777 ON READER
SERVICE CARD

Master Piece

A four-in-one accessory that combines a surge and spike protector, a power control switch, a monitor swivel base, and a static charge protector. The power control switch connects up to five components, including the computer, to one master switch.

(List Price: \$139.95)
Kensington Microwave Ltd.
251 Park Ave. So.
New York, NY 10010
(212) 475-5200
Telex: 46-7383

CIRCLE 776 ON READER
SERVICE CARD



T200 Tilt/Swivel Monitor Base, Computer Accessories Corp.

Sound Enclosure Printer Table

A printer enclosure providing noise and vibration suppression and a tabletop work surface. The printer table features a gas-spring hinged top and side panels for access to the printer mounted inside. Power strip and wires can be housed inside the enclosure, with wiring guided through the legs.

The Sound Enclosure Printer Table is available separately or as part of a complete line of matching furniture components. Other units in the line include a series of interconnecting table systems, racks for mounting electronic equipment and instruments, and matching bookcases.

(List Price: \$857)
Computer Cabinet Corp.
1290 Anvilwood Ct. #17
Sunnyvale, CA 94089
(408) 734-9120

CIRCLE 662 ON READER
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SERVICES**International Software Centre (I.S.C.)**

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The organization is a joint venture of E.J. Rhodes Assocs., a Boston-based consulting firm, and Interlingua Languages Ser-

vices, a London-based translation firm with offices in New York, U.K., Germany, France, Austria, Spain, Singapore, Hong Kong, and Buenos Aires.
I.S.C.

10 Speen St.
Framingham, MA 01701
Telex: 94-8477
(617) 879-8585

CIRCLE 648 ON READER
SERVICE CARD

PUBLICATIONS**Data File Programming on Your IBM PC**

A 219-page tutorial, written by Alan Simpson, for using BASIC commands in data management applications. Routines are included for data entry, editing, sorting, and searching, and report printing.

Sequential and random access files, using a gradebook system and a sales-tracking program as examples, are covered in detail. Other examples demonstrate the creation of mailing list and library referencing programs. A reference summary of BASIC commands is also provided.

(Cover Price: \$15.95)
Sybex
2344 Sixth St.
Berkeley, CA 94710
(415) 848-8233
Telex: 33-6311

CIRCLE 641 ON READER
SERVICE CARD

PUBLICATIONS

Leading Consultants in Computer Software

A 290-page directory of 7,000 nationwide consultants and consulting firms. The directory, published annually, contains a 30,000-keyword index categorizing the entries by hardware brand, expertise, and geographic location.

A typical entry consists of the consultant's name, address, and phone number; breadth of experience; and areas of expertise in hardware, systems programming, applications, and computer languages. (Cover Price: \$75) Research Publications, Inc.

12 Lunar Dr., Dept. AA
Woodbridge, CT 06525
(203) 397-2600

CIRCLE 642 ON READER
SERVICE CARD



Leading Consultants directory, Research Publications, Inc.

BASIC Is Child's Play

An introduction to BASIC programming on the IBM PC for grammar school children by authors Judy Gordon, Bob Grauer, and Marsha Schemel. The book is written in simple language and is illustrated with programming examples tied to the standard grammar school curriculum.

Each of the chapters begins with a "Stop, Look, and Learn" page and concludes with an "Accomplishments" section for reinforcement. Among the subjects covered are the PC keyboard, commands, editing, the PRINT statement, and loops.

BASIC Is Child's Play also includes five game and project programs ready to be entered and run. (Cover Price: \$16.95) Prentice-Hall, Inc. Englewood Cliffs, NJ 07632
(201) 292-5352

CIRCLE 640 ON READER
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IBM PC Programs in Science and Engineering

A collection of over 100 scientifically oriented BASIC programs, written by Jules and Scott Gilder. The programs cover mathematics, data analysis, electronics, computer-aided circuit design, communications, and attenuator pads. Each

New on the Market Submission Guidelines

1. Please include the retail price, distribution methods, and details of both hardware and software requirements needed for an end-user to properly use your new product. For software especially, this includes required amount of RAM, number and type of disk drives, operating system(s) supported, and any peripheral equipment needed.
2. Releases should be typewritten double-spaced on one side of the paper. Copies of advertisements for the product may be included, but in most instances we need more information about a product than is typically included in an ad.
3. Include telephone contacts for marketing and technical questions.
4. If available, include black-and-white glossy photos of the product, 4 x 5 in. or larger.

Please note that all products are run on a space-available basis. It is impossible to guarantee publication of a product announcement for any particular issue.

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application includes an introduction to the program's theory and algorithm, a listing, a sample run, and an explanation of the results.

The 256-page book also provides statistical programs for solving means, standard deviations, averages, curve-fits, and interpolation. It also offers tools for the design of amplifiers, power supplies, matching networks, and active and passive filters. (Cover Price: \$18.95) Hayden Book Co. 10 Mulholland Dr. Hasbrouck Heights, NJ 07604
(201) 393-6306

CIRCLE 643 ON READER
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Here Come the Clones!

An illustrated guide through the PC compatibles, by Melody Newrock. Among the compatibles discussed are Columbia, Compaq, Eagle, Hyperion, TI Professional, and Sperry systems. Each is compared for compatibility, performance, and price. Areas compared include graphics and display clarity, memory storage capacity, and clock speed.

(Cover Price: \$18.95) McGraw-Hill Book Co. 1221 Ave. of the Americas New York, NY 10020
(212) 512-3493

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PC User Groups

This list is a partial directory of PC user group names and addresses. Use this listing to locate other PC aficionados who congregate in your area or around the world.

ILLINOIS

Association of Personal Computer Users (APCU)

323 South Franklin, #804
Dept. A-202
Chicago, IL 60606

Chicago Computer Society

P.O. Box 95625
Hoffman Estates, IL 60195

Corona and Other PC Compatibles Users Group

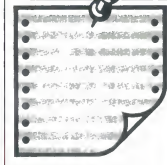
c/o Dan S. Tong
1310 Maple Ave.
Evanston, IL 60201
(312) 864-7549

Central Illinois PC Users' Group

c/o William J. Crampon
P.O. Box 3351
Springfield, IL 62708
(217) 787-1948

Loop & Lakefront IBM PC Users Group

c/o J. A. Tanenbaum
336 W. Wellington
Chicago, IL 60657
(312) 248-1774



I-PUG

c/o Roger A. Peterson
2805 N. Easton Pl.
Peoria, IL 61604
(309) 688-4695

INDIANA

ComputerLand User Group

c/o Susan Shields
ComputerLand
5450 N. Coldwater Rd.
Fort Wayne, IN 46825
(317) 259-7892

Muncie PC User Group

2809 E. Jackson St.
Muncie, IN 47303

South Bend PC Club

c/o Thomas R. Lafree
19525 Cleveland Rd.
South Bend, IN 46637
(219) 277-3344

The North East Indiana IBM-PC Users Group

c/o George Gynn
9904 Goshen Rd.
Ft. Wayne, IN 46818
(219) 693-3147

Terre Haute PC Users Group

P.O. Box 3174
Terre Haute, IN 47803

Northern Indiana IBM PC Users Group

c/o Dr. Terry Alley
316 N. Ironwood Dr.
South Bend, IN 46615
(219) 289-5506

Notre Dame PC User Group

c/o Paul E. W. Hemmeter
P.O. Box 597
Notre Dame, IN 46556
(219) 239-5295

PC will publish a periodic listing of PC user groups. Send new addresses or address changes to Club News, PC, One Park Ave., New York, NY 10016. New groups and address changes are shown entirely in **boldface**.

CLUB NEWS

IBM PC User Club

c/o Jo Spangler
Microbase Software, Inc.
P.O. Box 40353
Indianapolis, IN 46240
(317) 877-4304

IBM PC Users Group, Inc.

P.O. Box 2532
Indianapolis, IN 46206
c/o Mike Cabat

Southwestern Indiana IBM PC Users Group

P.O. Box 4874
Evansville, IN 47711
(812) 479-7790

PC Bloomington Area User Group

c/o Michael L. Hoyt
Rt. 2, Box 65
Solsberry, IN 47459
(812) 825-7384

IOWA

Cedar Falls User Group

c/o Lee Ann Moore
Black Hawk Village Shopping Center
Cedar Falls, IA 50613

IBM PC Users Group

P.O. Box 246
Des Moines, IA 50301
Attn: Gary Wilcox
(515) 967-5880

Hawkeye-PC

c/o Ben Blackstock
385 Collins Rd. N.E., #201
Cedar Rapids, IA 52402
(319) 393-5416
Bulletin board:
319-363-3314

Quad Cities PC Users Group

c/o Lew Roberts
P.O. Box 464
Bettendorf, IA 52722
(319) 391-9437

KANSAS

Topeka Library User Group

c/o Becky Hinton
Topeka Public Library
515 W. 10th St.
Topeka, KS 66604

IBM Users Group of Lawrence

P.O. Box 1403
Lawrence, KS 66044

Wichita IBM PC Users Group

P.O. Box 18422
Wichita, KS 67218

KENTUCKY

Kentucky-Indiana Personal Computer Users' Group

c/o Robert D. Hastings
P.O. Box 3564
Louisville, KY 40201
(502) 589-0254
Bulletin board: 6 p.m. to 9 a.m.
(502) 896-4419

Bluegrass IBM PC Users Group

c/o Diane Skoll
Computing Center
Rm. 72, McVey Hall
University of Kentucky
Lexington, KY 40506-0045
(606) 257-2900

Ohio Valley IBM PC User Group

c/o Frank Wight
1735 Frederica St.
Owensboro, KY 42301
(502) 926-2922

LOUISIANA

The Baton Rouge PC Users Group

c/o Tom Wichser
3375 King Bradford
Baton Rouge, LA 70816

MARYLAND

Baltimore IBM PC Users Group

c/o Ed Honabach
1910 Trout Farm Rd.
Jarrettsville, MD 21084
(301) 557-9965

Capital User Group, Inc.

c/o Jan Withro
P.O. Box 3189
Gaithersburg, MD 20878
(703) 978-1530

Annapolis PC Users Group

c/o Bill Ahern
1409 Forest Dr.
Annapolis, MD 21403
(301) 268-8779

The IBM PC Business Users Group, Inc.

40 W. Chesapeake Ave., #300
Towson, MD 21204

MASSACHUSETTS

SIG/86

c/o Joseph Boykin
47-4 Sheridan Dr.
Shrewsbury, MA 01545
(617) 845-1074
(617) 366-8911, ext. 3216

IBM PC Users Group

The Boston Computer Society
One Center Plaza
Boston, MA 02108
(617) 367-8080

Massachusetts IBM PC Users Group

c/o Robert L. Ward
P.O. Box 1014
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Belchertown, MA 01007

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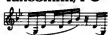
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byte of memory, the sum of the eight data bits plus the parity bit is always an even number. The sum is regularly checked by parity-checking circuitry, and if the computer detects an error, it immediately sends a signal called an "interrupt" to the microprocessor.

There are two basic types of interrupts: maskable and nonmaskable. The vast majority of interrupts are maskable; the entire group of maskable interrupts can be turned off by a single instruction to the CPU. There is only one nonmaskable interrupt (NMI) in the PC; it can be disabled only by a sequence of instructions. The group of maskable interrupts must all compete for a connection to the microprocessor, while the NMI has a private direct line. In the PC, parity-checking errors are given top priority, and when a parity error occurs, an NMI is immediately dispatched.

When the microprocessor receives an NMI signal, it drops everything that it is doing and transfers control to the NMI interrupt handler, which is normally located in IBM's BIOS. But here's the problem: when the BIOS learns that a parity check error has been detected, it clears the screen, prints a "Parity Check" message,

and halts the computer. Period. What do you do when you have just spent three hours updating a spreadsheet and this occurs? Start over. Period.

Why did IBM put a time bomb in its BIOS? In some instances, an error in one bit (which is enough to generate an NMI)

When the BIOS
learns of a parity
check error, it
halts the computer.
Period. What do you
do when this
occurs? Start over.
Period.

can be serious. For example, if your checkbook balance says you have \$16,002.00 when you only have \$2.00 (or vice versa), you might be faced with a few headaches until you find the error. If an error occurs within the guts of the operating system, a critical command could be rendered useless.

(continued)

```
comment * PARINT.COM - (C) 1984 by David S Hunter.
          This program may be freely copied but may not be sold for profit.

PARINT.COM is detects parity errors, logs them on the printer if
possible, beeps, and returns to program execution. The system does
not halt when this program is resident. Parity error checking is
terminated after first error is detected. The error message
includes the time of the event. If the printer is not available,
errors are logged to the screen.

*
***** Addresses of interrupt handlers *****

Book      segment at 0h      ;this is where the interrupt address book is
org       $2e4              ;
Int_2     label dword       ;address of NMI handler
Book      ends

***** Beginning of PARINT instructions *****
cseg
segment
assume cs:cseg
org 100h

Starts: jmp nearvec          ;install new NMI handler in RAM

***** NMI handler *****

newint    proc near          ;new interrupt handler
          assume ds:cseg, es:cseg
          sti                ;this flag was cleared when interrupt was issued
          jmp go             ;jump over more data

;*****
```

(continues)

Figure 1: Assembly language listing to create **PARINT.COM**.

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PROGRAMMING

But odds are that the majority of parity errors will occur in an unimportant or unused part of memory. The operating system takes up only a fraction of memory, and there are large regions of unused RAM in many applications. In addition, since one chip in nine is a parity-checking chip, one parity error in nine probably occurs on the parity checking chip itself. When that happens, your system can crash when no actual data has been altered and the checking mechanism itself is to blame for the error.

A Low-Cost Insurance Policy

Although you can completely disable parity checking either by turning a switch on certain hardware boards or by running a small program, this probably isn't such a good idea. Parity checking is done for a good reason, and if your memory is starting to get flaky, you should know about it. However, no one in his right mind would want the detection of a single parity error to freeze his system and destroy all unsaved work.

The PARINT.COM program in Figure 1 intercepts any NMI signals before the IBM BIOS can do its dirty work. PARINT.COM logs the time of the error on your printer (or on your screen, if the printer isn't ready), disables all parity checking, and returns control to you. At that point, you decide whether you want to start over or keep working. The cost is modest—PARINT.COM consumes a mere 666 bytes of RAM when installed. Once you load this small program into memory, you can be confident that a parity error will not trash everything you've done since you last saved your work.

PARINT.COM is not completely foolproof. If you are using a print spooler while printing a document when an error occurs, you may not see (or hear) the error message until the data ahead of it in the queue has been printed. And if a memory error occurs in the operating system, it might cause the computer to crash before the error is detected. Some programming mistakes can generate multiple errors,

```

gos:  push    cx
      push    dx
      pushf
      push    dx
      push    bx
      push    ax
      pushf
      mov     al, 80h
      out     80h, al          ;turn off parity checking for now
      xor     cx, cx          ;cx=error flag; cx=1 if parity OK
      in      ax, 62h         ;get data in port C

; -- find origin of NMI --
test  al, 40h
jz     other
mov    dx, offset par2      ;if bit 5 set, error is on expansion board
jmp    out                  ;print message and exit

other: test  al, 80h
      mov    dx, offset par1 ;if bit 7 set, error is on main board
      jmp    out              ;print message and exit

other: or    cx, 1h          ;if neither bit set, no parity error occurred,
      mov    al, 80h         ;set parity OK flag
      out     80h, al         ;turn parity checking back on.
      jmp    noprt           ;Don't print message if no parity error.

; -- print error message and exit. Type of exit depends on type of error --
out:   mov    ax, cx
      mov     dx, ax
      call    whatime         ;allow access to messages
      mov     bx, device1     ;get time of error
      cmp     bx, 0004h       ;if output is to printer, make sure its ready
      jne     fi
      call    testprt
      call    print
      mov     dx, offset time ;"time of error" message
      call    print
      mov     dx, offset paroff
      call    print

noprt: popf
      pop     ax
      pop     bx
      pop     dx
      popf
      pop     ds
      test    cx, 1h          ;special exit if parity OK
      jnz     oth
      pop     cx
      iret                    ;message printed; let execution continue

; If no parity error, turn control over to pre-existing NMI handler.
; This is done by restoring DS and jumping to the instruction that
; specifies the address of the old interrupt routine. This unusual exit
; is necessary because otherwise, once DS was restored, the address of the
; old interrupt routine would not be accessible.

oth:   cli
      pop     cx
      jmp     SetOut

newint endp

;***** SUBROUTINES *****

Testprt proc near
      push    dx
      push    ax
      xor     dx, dx          ;printer # 0
      mov     ah, 2
      int     17h             ;read printer status
      test    ah, 00100101b    ;error bits
      jz      aok
      mov     bx, device2     ;if not ok, try other device
aok:   pop     ax
      pop     dx
      testprt endp

Print   proc near
      push    cx              ;output to file named in bx; if error try another file

```

(Figure 1 continues)

PROGRAMMING

```

mov     cx,24      ;34 characters to print
mov     ah,40h     ;DOS function call
int     21h
pop     cx

print   endp

WhatTime proc near    ;what time is it? put result in hour/min
push    cx
push    dx
mov     ah,20h      ;DOS time
int     21h
mov     al,ah        ;hours (0-23)
call    convt        ;put tens in ah, ones in al
mov     hour,"00"
add     hour,ax
mov     al,cl
call    convt        ;do same for minutes (0-59)
mov     min,"00"
add     min,ax
pop     dx
pop     cx
ret
WhatTime endp

Convt   proc near    ;convert number ((100) to ASCII. Number is in al.
;result: tens in ah, ones in al.
xor     ah,ah        ;input is less than 100 anyway, so clear it
push    cx
mov     cx,10
div     cx            ;divide ax by 10

littles: ret
convt   endp

;***** INSTALL NMI HANDLER *****

NewVec  proc near
jnb     past

loaded  db 80h,0Ah,"PARITY ERROR INTERCEPTOR v2.00 by David Hunter IS NOW"
db      "INSTALLED",0Ah,0Ah,"s"

past:   mov     dx,offset loaded
mov     ah,9
int     21h
assume ds:book      ;interrupt address book area
push    ds           ;save old ds for future use
mov     ax,book
mov     dx,ax
mov     al,80h
out     80h,al       ;turn off parity checking
mov     ax,int_2
;get the address
mov     oldint,ax     ;save it for some future use
mov     ax,int_2(2),ax ;second part of double word
oldint(2),ax
mov     int_2,offset newint ;now load the new address
;ice is ds in csm program
mov     int_2(2),cx
mov     al,80h
out     80h,al       ;turn parity checking back on
mov     dx,offset newvec ;save new interrupt routine resident
int     21h          ;don't need "newvec" or beyond

newvec  endp
csseg   ends
and     atart

;----- DATA -----

GetOut: nop
Instruc db 0EAh      ;this is the jump-immediate instruction!
;it jumps to the address stored in oldint.

Didint  dd 0000h     ;address of old interrupt 2 routine -
Device1 dw 0000h     ;printer
Device2 dw 0000h     ;standard output device
par1    db 80h,0Ah,"Parity Error: Main Board",07h,0Dh,0Ah
par2    db 80h,0Ah,"Parity Error: Expansion Board",07h,0Dh,0Ah
time    db "TIME: "
hour    dw "00"
min     dw "00"
sec     dw "00"
paroff  db "PARITY CHECKING NOW DISABLED",0Dh,0Ah,0Ah

;----- MAIN PROGRAM -----

```

(Figure 1 ends)

including parity errors. When this type of mistake occurs, the parity error message appears just before the other errors cause the system to crash. Although these errors are not covered by PARINT, they are rare compared with the errors that the program can protect you from.

If you are sold on the idea of PARINT and don't care how it works, assemble the code in Figure 1 using the ASM/MASM Assembler or run the BASIC program in Figure 2. Either method will create the PARINT.COM file. Put PARINT on your boot disk. Also, be sure to place it in your AUTOEXEC.BAT file so that it will always be present when your computer is running. PARINT will not interfere with any other programs that use the NMI, because if it receives an NMI when no parity error has occurred, it returns control to any other resident NMI interrupt handlers. When an error does occur, save your work and re-initialize memory by turning the computer off and then back on. If you are interested in the theory behind the program, read on.

PC Address Book

Every PC interrupt is assigned a number (the NMI is assigned interrupt number 2). When the microprocessor learns that an interrupt has occurred, it looks up the address of the interrupt-handling routine in an "address book," which is a reserved block of memory. Normally, the address of IBM's NMI handler is present in the address book. Intercepting the interrupt-handling routine is simply a matter of changing this address to the address of the new routine. The microprocessor then obediently executes instructions in the modified NMI interrupt handler every time an NMI occurs.

The address book is located at the beginning of memory, and the address of each interrupt-handling routine takes up four bytes in the book. Interrupt number 0 takes up the first four bytes, interrupt 1 the next four, and interrupt 2 (the NMI) the next. The segment labeled "Book" in Figure 1 overlaps the actual address book.

PROGRAMMING

```

100 * PARINT.BAS -- by PC -- creates PARINT.COM parity disabler
110 *
120 *   *** Setup and check typing of DATA statements ***
130 *
140 DEFINT A-Z:CLS:KEY OFF:DIM YY(30)
150 PRINT "Wait -- checking DATA statements for accuracy..."
160 FOR I=1 TO 29:READ T:Y(YU)=T:YV=Y+T*NEXT:IF Y=37878: THEN 180
170 PRINT "Check your typing in lines 400-420 then restart." :END
180 FOR I=1 TO 29
190 TOTAL=0
200 FOR J=1 TO 16
210 READ J:H=VAL("H"+J)
220 TOTAL=TOTAL+H
230 NEXT
240 IF TOTAL=YY(1) THEN 260
250 PRINT "Check your typing in line 1:10:40:20 then restart." :END
260 NEXT
270 RESTORE 430:PRINT "Data is okay -- now writing to disk..."
280 *
290 *   *** Re-read DATA and create PARINT.COM disk file ***
300 *
310 OPEN "PARINT.COM" FOR OUTPUT AS #1
320 FOR I=1 TO 451
330 READ I:PRINT #1,CHR$(VAL("H"+I*20))
340 NEXT:CLOSE
350 PRINT "PARINT.COM created -- Now get into DOS and run it."
360 END
370 *
380 *   *** DATA ***
390 *
400 DATA 1310,1264,1101,1126,1459,797,602,627,1096,1010
410 DATA 1971,1510,2283,1341,1715,1070,1571,1691,1235,1125
420 DATA 2063,1155,1136,1370,1003,1476,1170,1335,246
430 DATA 09,47,01,F0,E9,92,00,90,00,00,00,00,00,00,00,01
440 DATA 00,00,0A,50,61,72,63,74,79,20,45,72,72,6F,7E,3A
450 DATA 20,45,01,69,6E,20,45,6F,61,72,64,20,20,20,20,20
460 DATA 07,00,0A,00,0A,50,61,72,63,74,79,20,45,72,72,6F
470 DATA 7E,3A,20,45,70,70,61,6E,73,69,6F,6E,20,4E,6F,61
480 DATA 72,64,07,00,0A,20,20,20,20,45,49,40,45,3A,20,20
490 DATA 30,30,3A,30,30,20,20,20,20,20,20,20,20,20,20,20
500 DATA 20,20,20,20,00,0A,50,61,72,63,74,79,20,45,3A,20,45
510 DATA 43,43,40,49,4E,47,20,4E,4F,27,20,44,49,53,41,4E
520 DATA 4C,45,44,20,20,00,0A,00,01,1E,9C,5E,53,50,9C
530 DATA 90,00,0E,40,33,C9,E4,62,40,4E,74,06,3A,33,01,E0
540 DATA 16,90,00,00,74,06,0A,11,01,E0,0C,90,01,C9,01,00
550 DATA 00,00,0E,00,0A,00,23,90,0C,0E,00,00,4C,00,00,1E
560 DATA 00,01,63,F0,0A,75,03,E0,22,00,E0,33,00,0A,35,01
570 DATA E0,20,00,0A,77,01,E0,27,00,9D,50,30,50,9D,1F,F7
580 DATA C1,01,00,70,02,09,C7,FA,59,E9,00,FF,3E,50,33,DE
590 DATA 0A,00,CD,17,F6,CA,E9,74,0A,00,1E,0F,01,50,5A,C3
600 DATA 51,09,0E,00,0A,40,CD,21,59,C3,31,5E,0A,CD,CD,01
610 DATA 0A,C0,0E,1C,00,C7,0E,60,01,30,30,01,0E,60,01,0A
620 DATA C1,E0,00,C7,0E,63,01,30,30,01,0E,63,01,5A,59
630 DATA C3,3E,4A,31,01,0A,F6,F1,39,C3,E0,45,90,00,0A,50
640 DATA 41,50,49,5A,59,00,45,5E,3E,4F,50,20,49,4E,5A,45
650 DATA 5E,43,45,50,5A,4F,5E,20,75,3E,0F,30,30,60,79
660 DATA 20,44,61,76,69,6A,20,40,75,6E,74,63,72,20,49,53
670 DATA 20,4E,4F,57,20,49,53,5A,41,4C,4A,45,44,00,0A
680 DATA E4,0A,40,0E,0A,07,CD,21,1E,00,00,00,0E,00,00,00
690 DATA 0E,00,0A,00,0E,00,0E,00,00,00,00,00,00,00,00,00
700 DATA C7,0E,00,00,00,00,00,00,00,00,00,00,00,00,00,00
710 DATA 0E,CD,27,00,00,00,00,00,00,00,00,00,00,00,00,00

```

Figure 2: PARINT.BAS program to create PARINT.COM.

so that by giving a part of that segment a label, the address contained within that book becomes accessible. The label "Int _ 2", which is offset 8 (interrupt number 2 x 4 bytes per interrupt) from the beginning of the book, contains the address of the NMI interrupt handler.

The first instruction in PARINT is located at "Start." This tells the microprocessor to jump over the code for the NMI handler to the section labeled "In-

stall NMI handler." This particular part of the program prints a message on the screen and permanently loads the NMI handler into RAM.

It takes four steps to install the NMI handler. First, the NMI is temporarily turned off by sending a zero to I/O address 10 (0A in hexadecimal notation). If this were not done and an NMI occurred while addresses were being changed, the system could crash. At this point, parity checking

is completely disabled. Second, the address of the old NMI-handler is stored in "Oldint," and the address of the new routine ("Newint") is put in its place in the address book (at "Int _ 2"). Third, the NMI is turned on again by sending an 8 to I/O hex address 0A. Fourth, DOS is told that this program is finished for now but that it should not be erased from RAM.

Only the installation procedure, which starts at the label "Newvec" and is no longer necessary, is discarded. The rest of the program, which is the interrupt handler itself, remains resident in memory. Once these four steps are carried out, the instructions that start at "Newint" are executed whenever an NMI is detected.

When Disaster Strikes

Because this is a .COM program, it cannot have a separate data segment; instead, the data and code segments overlap. Therefore, the first instruction of the NMI handler is a jump over the data. The next instructions save the register values and turn the NMI off. Next, to find out whether a true parity error caused the NMI, data is read in from hexadecimal port 0C (at I/O address 62) and placed in register AL, and bits 6 and 7 of this data are examined. If bit 7 is a 1, then the parity error was on the main circuit board. If bit 6 is a 1, then the parity error was on an expansion card. If neither bit is a 1, then there was no parity error.

In the first two cases, the program prints an error message (subroutine "Print") and returns control to the application that was running when the error occurred, which lets the user take whatever action is necessary. Otherwise, no message is printed, the NMI is turned on again, and control is turned over to the original NMI interrupt handler. This final step is necessary because there are other programs that use the NMI.

To preserve data entry screens, PARINT prints the error message on the printer if possible. Another reason that it writes to the printer is that if a program has been running unattended, you can check the

PROGRAMMING

printer to see if and when an error occurred while you were gone. The time of the error is determined by subroutine "Whatime." Subroutine "Testprt" makes sure that the printer is ready for data by using BIOS interrupt 17 to check the printer status. If the printer is turned off, missing, or busy, the error message is printed on the screen. If you prefer to have the data always printed on the screen, just exchange the values of "Device1" and "Device2" in the data area.

An unusual feature of PARINT is the method it uses to hand control over to other interrupt handlers if an NMI is generat-

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message again.

ed when no parity error has occurred. The problem has to do with restoring the data segment before leaving the program; the solution involves storing the machine code for a JUMP instruction in the data area. An explanation of why this is necessary is, unfortunately, beyond the scope of this article.

Never Again

Parity checking is a smart idea, but halting the computer when an error occurs is just plain stupid. Protect yourself from IBM's oversight by putting a copy of PARINT.COM in your AUTOEXEC.BAT file. The program can't be tested without taking the top off the computer, but trust me—with PARINT insurance, you will never see the dreaded frozen "Parity Check" message on your screen again. ■

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CIRCLE 224 ON READER SERVICE CARD

User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.

Bug Hunt

In working my way through the mass of IBM literature, I have been greatly helped by *PC Magazine's* tips on bugs and programming in general. I've also uncovered



seven bugs on my own and hope that this information will help others:

1. The first may qualify as a bug in IBM's BASIC. If your default drive is A: and you are trying to rename a file in drive B: with the BASIC NAME command, you get a "Rename across disks" error message. The solution is to not use the format given in the manual. Instead, use "NAME filespec AS filespec."

2. Advanced programmers using IBM's ASM/MASM Assembler may be puzzled by a mysterious "?End of file encountered on input file" error message

that appears on start-up. If you search through IBM's manuals, you won't find it listed anywhere. All it means, however, is that you probably answered the start-up prompts with a complete filespec instead of just a filename. All the assembler wants is "[d:;filename]". You probably entered "[d:;filename.ext]".

3. If CHKDSK on your PC reports one more hidden file than you think you should have, don't panic. You probably just formatted the disk with the /V switch. CHKDSK reports the VOLUME ID label as a hidden file.

4. Do you get annoyed when your batch files end with a double prompt, for example, A>A>_ , on the next line? You can avoid this simply by typing the end-of-file marker (Ctrl-Z or function key F6) on the same line as the last command instead of all by its lonesome on the next line. A blank space typed before the marker is optional.

5. Maybe you get annoyed at the way REMs clutter up your display when you want to make a REMARK in a batch file with ECHO ON. Try using a period (.) instead. It means the same as REM, but it yields a much neater display. There is also another use for the period with ECHO OFF. How many times have you wanted your display to skip lines between commands? Use an ECHO . command wherever you want a blank line. The line dis-

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USER-TO-USER

played will be blank except for a single period in the first position.

6. If you're using your text editor or word processor to write batch files (you can, you know), the end-of-file marker is usually not available from the F6 key. Use a Ctrl-Z key combination instead. Don't be alarmed if your screen shows a "right arrow"; it's just the ASCII symbol for Ctrl-Z. Your computer knows enough to make the translation automatically.

7. Finally, for those brave souls using a RAMdisk, don't forget you must have a complete operating system in place if you want to invoke DOS commands from the RAMdisk. Use SYS d: and COPY COMMAND.COM d: to load IBMBIO.COM, IBMDOS.COM, and COMMAND.COM into the first three files on your RAMdisk. Make sure that they are the first three files and that IBMBIO.COM resides in contiguous sectors. The easiest way to do this is to start with a completely empty RAMdisk.

Bill Kriengel, Jr.
Valley Stream, New York

Thanks for the tips. A few notes, though: When renaming files on one disk from another, be sure and play it safe by putting the drive at the beginning of each, for example, name B:TEST.BAS as B:RETEST.BAS. While it's true that the BASIC manual is confusing on this issue, it makes one good point—filenames don't default to a .BAS extension; you have to add it if you want it.

It's generally safe to end a line with Ctrl-Z (the F6 key in DOS), but there are times when a line has to end in a carriage return. For instance, if you're typing in CONFIG.SYS files and trying ANSI magic, you have to hit the carriage return before the Ctrl-Z. But normal batch files don't usually need the extra carriage return.

DOS 3.0 doesn't let you use a "" instead of a REM. Why IBM removed it is a real mystery. Also, I've never had much trouble executing DOS commands from my old AST RAMdisk. (However, now that

I've been spoiled by the PC AT, I use the lightning-fast hard disk instead.) If you want to save trouble, you can use the COMMAND C:\ to move COMMAND.COM, but it's not necessary to schlep the hidden files there.

Magic Batch Fingers

Some DOS commands, such as FORMAT and ERASE *,*, require keyboard input and thus cannot be used in an untended batch file. For example, if you enter FORMAT A:/V, you will be instructed to place the disk in drive A: and

DOS 3.0 doesn't
let you use a
"." instead of a
REM for remarks.
Why IBM removed
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mystery.

to press any key to continue. You will then be asked to enter a VOLUME ID for the disk, and then whether you want to format another. If this FORMAT command were being executed from a batch file, the batch processing would stop and wait for your keyboard responses to these prompts. I've devised a simple method to eliminate the keyboard input.

First, either with a word processor or using the DOS COPY CON: command, I construct a file called RESPONSE that will contain the responses

A>COPY CON:RESPONSE

NEWDISK

N

Z

Note: The first line copied to the file is a blank line produced by just pressing Return. This is important since it contains the Return key press needed in response to

USER-TO-USER

"Press any key to continue."

NEWDISK will be the VOLUME ID. N is the response to the prompt, "Format another (Y/N)?". "Z" is an end-of-file marker obtained either by pressing the F6 function key or by holding down the Ctrl key and hitting Z.

Next, I place the following line in the batch file where I would normally put my FORMAT command:

```
TYPE RESPONSE|FORMAT A: /V
```

The TYPE command would normally display the contents of RESPONSE on the screen, but the | symbol instead pipes the contents of RESPONSE to the inputs in the FORMAT command, so they answer the prompts that would normally be answered from the keyboard.

This same method can be used to answer the "Are you sure?" prompt, which comes up if you enter ERASE *.*. The keyboard inputs in these DOS commands are safety features that help prevent accidental erasures by letting the operator verify the command entry before it executes, so be sure to use them with great care.

David Mannering
Lawrence, Kansas

This simple trick can work wonders automating batch files and speeding up things in general. For instance, if you're performing lots of DISKCOPIES, you can load the disk to be copied onto a RAMdisk and then write a batch file to DISKCOPY to A: and then B: and then go back to the beginning and copy to A: again—all without having to enter lots of Y's to continue. This lets you replace copied disks with raw ones in rapid succession.

*This also lets you do such nasty things as putting DEL *.* commands in various places that don't need confirmations. If you're putting together a big batch file with lots of commands that would ordinarily need responses, be sure the responses are synchronized to the questions. If a complex batch file encounters an error, you could end up confirming*

some very destructive commands. You can do serious damage—even with simple files. For example, if you create a file, called TROUBLE, with just a Y and car-

A complex batch file could confirm some very destructive commands.

riage return in it, then type

```
TYPE TROUBLE | DEL *.* *
```

your disk suddenly turns blank (if you do try this, you can replace all the files with DEBUG by using the L command to load in the directory and then changing all the hex ES's back to their original characters). But, for general purposes, this trick is a real winner.

Tidy Lister

After putting up with "untidy" listings of long BASIC programs, help files, and the like for too long, I decided to try modifying the DOS 2.0/2.1 MORE filter to pause after a full page rather than a 24-line screenful. For a clean listing, I altered MORE to pause every 55 lines. The procedure is as follows:

1. Make a copy of MORE.COM under another name—I use PORE.COM.
2. With DEBUG.COM and the new file in the default drive, enter the following (user input is underlined):

```
A>DEBUG PORE.COM
- D
- E0118
- XXXX:0118 19.37
- W
- Q
```

(Note: check for the value "19" at offset :0118—the byte at the right of the long line, and ignore the numbers that replace XXXX.)

Now, when you need a listing of a BASIC program (saved in ASCII) or any ASCII file from DOS, enter

```
TYPE FILENAME | PORE>LPT1:
```

Use the correct device name (if different) in place of LPT1:. After listing 54 lines of the file, the printer pauses. With a quick Off-Line/Form-Feed/On-Line sequence and a press of any key, the next page is off and running. This process is exactly the same for DOS 2.1.

John Slocum
Brentwood, Missouri

You can also create a batch file, called PMOR.BAT, that automatically does this job for you. Type in everything below except the A> prompt, hit the Enter key at the end of each line, and put an end-of-file marker at the end by either hitting F6 or typing Ctrl-Z.

```
A>COPY CON:PMOR.BAT
TYPE %1 | PORE>LPT1:
Z
```

Then, to type a file with the new PORE pauses in it while in DOS, just enter PMOR FILENAME (obviously, don't type in FILENAME; you substitute the name of your file there). Also, to avoid having the phrase "--more--" appear on your printouts, while you're in DEBUG, add the following line just before you write (by hitting W):

```
-F 1F1 1FA 20
```

This replaces the "--more--" message with blank spaces.

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PC Tutor



Command Tail Chasing

Q: I wrote a professional billing package in BASIC that originally ran under CP/M; I've recently modified it to run under MS-DOS. I still have one problem that I can't find an answer to—at least not an answer that works.

One module in my program accepts a command tail—in other words, the arguments that follow the original program call. To do this, my program PEEKs at decimal address 128 and the addresses that follow.

This technique works fine in CP/M, but not in the MS-DOS version of my program. First I tried including a bare DEF SEG statement before the PEEK at 128; then I tried specifying DEF SEG=0. Still, the command tail remained out of my program's reach.

Finally, I tried hunting for the tail throughout the RAM with a test program that runs a loop with DEF SEG values from 0 through 1000. On an IBM PC with 128K RAM, I found the tail when DEF SEG=775. Unfortunately, with a different memory configuration, the tail wasn't in the same location.

The manuals for DOS 1.1 and BASICA say the DEF SEG=0 and PEEK(128) statements should take me directly to the

command tail. But when I compile the BASICA files into *.EXE programs and test them, no command tail can be found. What am I doing wrong?

David Alexander
Palo Alto, California

A: MS-DOS is unlike CP/M in that it does not load programs at a fixed address. Calling for a different number of disk buffers or installing RAMdisks, disk drives, or hard disks all influence where a program loads.

There is a hidden DOS call that can find out your program segment prefix (PSP). In general, however, you are better off setting up another way to communicate with your BASIC program. Rather than require the user to specify parameters when entering the command that calls up your program, you might instead prompt the user to input additional information once your program is running. Or your program could store the parameter information in a small, easily found, temporary file.

If you are determined to find the program segment prefix, however, note that the CS register in a *.COM program (for example, BASIC.COM) is always set to the PSP. With the GWBASIC of some PC-compatible computers, you can find the PSP by writing a small routine that returns the value of CS. With an IBM PC and its version of BASIC, however, this method will not work. An assembly language program to find the PSP would be more trouble to write than it's worth.

Protective Batches

Q: In using my PC-XT with DOS 2.0, I've avoided the danger of accidentally reformatting my hard disk, thanks to a simple routine involving batch files.

I've yet to figure out, however, how to

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PC TUTOR

write an erasing program as a batch file that would prompt me for a Yes/No answer before erasing any files. I'd like the prompts to be something like this:

You have instructed me
to erase 'Filename.Ext'
In directory 'Directory Name'
On disk drive 'Disk Label'
Are you sure?? (Y/N) _

Do you have any suggestions on how I can set this up most efficiently?

Ron Sheff
Great Neck, New York

A: First you need to create a program, which I call YN.COM, that handles the user's Y or N key response. This routine sets the error level flag to the value 1 unless the user taps the Y key.

The YN.COM program requires DOS Version 2.0 or later. You can enter this routine through DEBUG, following the sequence listed in Figure 1.

Once you have YN.COM working properly, you can use it in a little batch program, such as CDEL.BAT, which is listed in Figure 2.

Domestic Revision

Q: While in Europe, I purchased an IBM PC with one single-sided disk drive and an IBM monochrome monitor. Because this computer's system unit operates on 240V at 50/60 Hz, I need to know how to operate it back in the States. Is the solution simply to use an external step-up transformer?

I've also contemplated upgrading my single drive to a dual-drive system. To save money, I plan to purchase a compatible Tandon drive from a mail-order company and install it myself. I'd like more assurance that the drive will be compatible as is. To add a second drive to my PC, can I simply attach any drive advertised as IBM-compatible?

Larry Stuckey
APO, New York

A: Because the standard IBM PC can be

used in Europe by simply adding a transformer, you should be able to convert your PC for domestic use just as easily. (If any readers have experience with converting a foreign PC for domestic use, I'd be interested in hearing from you.)

As for installing a second drive, you shouldn't have any problem plugging in a

Tandon drive. Compatible drives from third-party manufacturers have been installed easily by thousands of PC users—including IBM and me.

If you're installing a single-sided drive, like the one in your system, you can look at the jumpers on your first drive and set the new drive's jumpers the same way. If

A) DEBUG

```
-A100
0xxx:0100 B80000      MOV     AX,0000
0xxx:0103 CD16        INT     16
0xxx:0105 3C59        CMP     AL,59
0xxx:0107 7408        JZ      0111
0xxx:0109 3C79        CMP     AL,79
0xxx:010B 7404        JZ      0111
0xxx:010D B001        MOV     AL,01
0xxx:010F EB02        JMP     0113
0xxx:0111 B000        MOV     AL,00
0xxx:0113 B44C        MOV     AH,4C
0xxx:0115 CD21        INT     21
-NYN.COM

-RCX
CX 0000
:17
-W
Writing 17 bytes
-Q
```

Figure 1: Follow this series of steps to use DEBUG to create YN.COM, an assembly language routine.

CDEL.BAT

```
echo off
echo You have asked me to erase: %1
echo Should I?
YN
if errorlevel 1 goto end
erase %1
:end
```

Figure 2: This batch file program, CDEL.BAT, asks a user for confirmation before erasing any file. This program calls on the YN.COM routine given in Figure 1.

PC TUTOR

you plan to upgrade to a double-sided drive—which I highly recommend—try to find a double-sided system to see how the jumpers are set.

Keep in mind that IBM's disk-drive cables are made differently. With IBM's arrangement, don't set up the drives the way you would assume, with one as drive

Printer Attachment Convenience Pac, which provides a direct cable connection between the PC and the printer. This costs \$220, plus the cables and manuals. For

\$625 more, the Printer Sharing Feature allows up to four PCs to use a single 5218 printer. Each PC in the system, however, also requires the \$220 attachment. ■

Compatible drives from third-party manufacturers have been installed by thousands of users, including IBM.

1 and the other as drive 2. Instead, you should make sure that both drives are set up as drive 1.

Displaywriter Answers

John Singer (of Fenton, Missouri) was kind enough to respond to Ann Adams's question on attaching a PC to an IBM 5218 Displaywriter printer. (See "A Displaywriter Dilemma," PC, Volume 3 Number 15.)

Singer pointed out that IBM provides two methods for attaching this daisywheel printer to the PC. First, the IBM Displaywriter/Personal Computer Attach Convenience Kit includes a cable attachment between the PC and the Displaywriter. Documents can be transferred from the PC to the Displaywriter, which then prints them on the 5218 printer. IBM's price for this hardware and software is \$1,164—for that amount you may be better off purchasing an additional printer.

IBM's other solution is called the 5218

The PC Tutor solves practical problems and explains points of general interest. If you'd like to see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.

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XT/370	E	K
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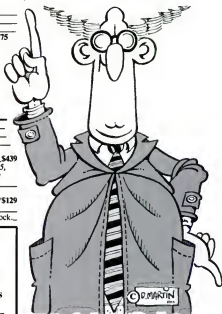
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A Frame of Reference

Framework may not turn you into a contender for the Nobel Prize for Literature, but it can help you organize your thoughts, outline your work, and write more effectively.

Since I frequently produce reports, memos, and presentations in addition to my professional writing, I gravitated to Ashton-Tate's *Framework* to see if I could use it to organize my thoughts, outline my work, and write more effectively.

Flexible and easy to use, *Framework*'s word processing function compares favorably with many fine word processing packages available for the PC. But those of you already using one may be satisfied with and accustomed to it. Then why bother learning another? What *Framework* brings to you, the writer, in addition to word processing, is an interesting tool for organizing your thoughts. You can use this tool in conjunction with word processing in order to write as you organize or organize as you write.

If you are already familiar with some form of PC word processing, then you'll find outlining and writing with *Framework* easy to learn. But if you are trying to master keyboarding, text editing commands, and printing procedures at the same time that you are learning *Framework*, you're unlikely to write meaningful anything. *Framework* does keep you going by providing on-line help that is clear and to the point and pull-down menus for each major function (word processing, outlining, spreadsheet, graphics, and data management).



When you've become comfortable with the mechanics of *Framework*, you'll find that for the tasks of outlining, it's head and shoulders above traditional pen-and-pencil methods in terms of flexibility and ease of use. You can move parts of the outline around, not only from one position in a sequence to another but also up or down through different levels. You can collapse the outline to view the big picture or expand one portion to scrutinize it in detail, and you can tuck paragraphs of text into the outline as they occur to you, then suppress their appearance when viewing the outline.

In contexts where the text has an inherent need to be organized logically—ex-

positions, reports, system documentation—the benefits of using *Framework*'s outlining capability are obvious. In other writing, such as fiction, where the organizing principle is more subjective, you could still use *Framework* ties to keep track of ideas that you want to associate with other ideas.

To create an outline, you begin by moving the cursor in *Framework*'s command menu first to Create and then to Outline. The display will look like Figure 1, and you will have two levels. The higher, more general level is designated 1, 2, 3, while the lower level is 1.1, 1.2, 1.3, 2.1, and so on. More detailed sublevels, such as 1.1.1, can also be added.

1	
1.1 (E)	
1.2 (E)	
1.3 (E)	
2	
2.1 (E)	
2.2 (E)	
2.3 (E)	
3	
3.1 (E)	
3.2 (E)	
3.3 (E)	

Figure 1: New outline with empty frames.

The symbol (E) means that a particular frame is empty. When you put something into that frame, the E will change to another letter to represent the frame's contents when you enter text.

After entering a filename, you can key in whatever occurs to you about the subject you've chosen. I find that even if I just enter a label for each outline section (rather than text in a word processing frame), I have enough structure to write the actual draft.

When you want to move among frames, the gray Plus key near the numeric keypad takes you down one level. *Framework* gives you just three sections (each with three subsections) to start with, but you can add as many sections or levels as you need by moving the cursor to 3, pressing the Ins key, then moving the cursor to Create. Revising your outline is as easy as editing a document. You can rearrange topics, delete outline sections and subsections, or add sections and material.

Augmenting an outline subsection with another level of detail can be a little tricky and confusing unless you're pre-

pared for what happens. The structure of *Framework* is such that a frame can either contain other frames or be contained by another frame, but it cannot be both the container and the contained. Thus when you try to enter new subsections under a frame that is marked as empty, *Framework* creates the subsections but puts them into a new section. Figure 2 shows what happens. I had labeled 1 "components" and had 1.1 as "microprocessors." I placed the cursor at 1.1 (with the intention of adding subsections under 1.1) and ended up with the subsections beginning 1.2.1.

Note that 1.2, 1.3, and 1.4 are not marked empty. They cannot contain data because they contain lower-level frames, whereas 1.5 and 1.6, which do not have subsections and therefore can contain a word processing or some other data frame, are marked (E).

You can delete sections you don't need by moving the cursor to the line you want to get rid of and pressing the Del key. To add text to existing sections, use the PgUp or PgDn keys and move the cursor to the section where you want to enter a paragraph, say 1.2.1. Pressing the F9 key opens the screen for writing. You can enter text, then get back to Outline mode by again pressing F9, which is a toggle. Once you enter text into the 1.2.1 frame, the (E) changes to (W).

Save your work to disk by pressing the Ins key, then move the cursor first to Disk and then to either Save & Continue, which copies to disk and leaves your work on the screen, or to Put Away, which saves it to disk and removes it from the "desktop."

Recently I discovered another use for *Framework*'s outline function besides organizing ideas within the piece of writing I'm working on. When used with the data management function, it can keep track of all those articles I saved but can never find when I want them. A simple way to file and retrieve articles without spending numerous hours putting them in order is to give each article the next

1 components	
1.1 microprocessors (E)	
1.2	
1.2.1 (E)	
1.2.2 (E)	
1.2.3 (E)	
1.3	
1.3.1 (E)	
1.3.2 (E)	
1.3.3 (E)	
1.4	
1.4.1 (E)	
1.4.2 (E)	
1.4.3 (E)	
1.5 (E)	
1.6 (E)	

Figure 2: Subsections added for detail.

number in a sequence and insert it in a three-ring binder in numerical order. You then enter its title and number into a *Framework* outline that organizes the topics covered by the articles. In a catalog of articles on stock market investing, for example, the higher levels are organized by topics of interest and divided into subtopics. The lowest level (the word processing frame) contains the title of the article, its number in the binder, date of article, and an abbreviation for its source (Bar=Barrons, BW=Business Week, F=Fortune, and so on).

Whether you plan your writing in a logical outline first or you're like the character who said, "I have to hear what I say to see what I think," *Framework*'s outlining capability will help you organize your ideas and notes—however sketchy or rambling—into a logical structure. It may not turn you into a more logical thinker, but it will certainly help you produce more orderly text. ■

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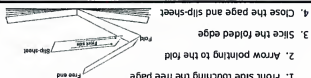
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